THE

MECHANICS' MAGAZINE,

MUSEUM,

Register, Journal,

AND

GAZETTE,

OCTOBER 7th, 1837—MARCH 31st, 1838.

VOL. XXVIII.

———————— "To know
That which before us lies in daily life,
Is the prime wisdom."—MILTON.

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Mechanics' Magazine,

MUSEUM, REGISTER, JOURNAL, AND GAZETTE.

No. 739.] SATURDAY, OCTOBER 7, 1837. [Price 3*d*.

MR. SAMUEL HALL'S PATENT PADDLE-WHEEL.

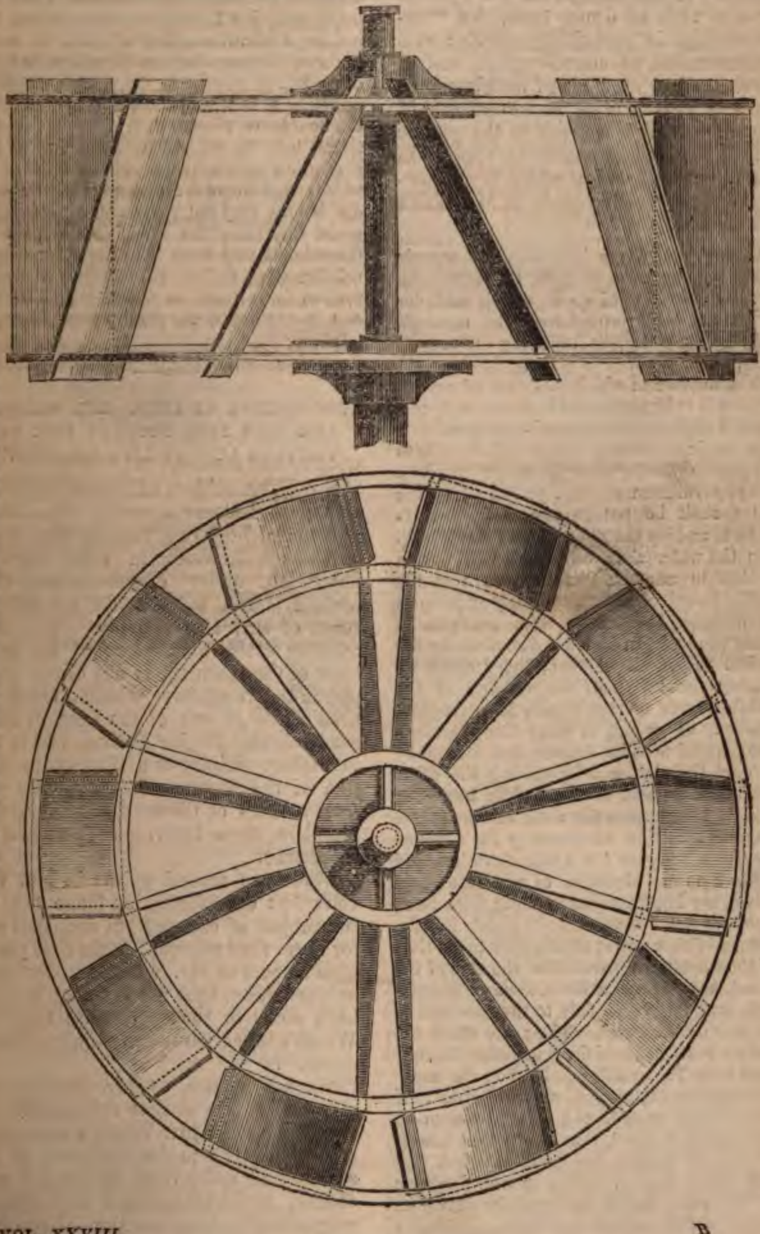


Fig. 2.

Fig. 1.

MR. SAMUEL HALL'S PATENT PADDLE WHEEL.

Mr. Samuel Hall, whose important improvements in steam-engines have given celebrity to his name, took out a patent on the 24th of June, 1836, for "improvements in propelling vessels; also improvements in steam-engines, and in the method or methods of working some parts thereof." The improvements in propelling vessels consist in the paddle wheel, of which an engraving appears in our front page, and of which the following is the exposition given in Mr. Hall's specification.

The object of my invention, as regards the propelling of vessels, is to reduce the tremulous motion of steam vessels and decrease the back water caused by common paddle wheels without impairing the propelling power.

The manner in which this part of my invention is to be performed is shown at figures 1 and 2 of the annexed drawing, and consists of a mode of affixing the paddle boards to the paddle wheels, whereby during one half of the revolution of each paddle wheel the water shall be put in motion in one direction, and by the other half of the revolution the water shall be struck and put in motion in another direction, so that the paddle boards shall be constantly striking in an oblique direction against currents of water produced in different directions by the paddle boards themselves; this I effect by placing about half of the number of the paddle boards on the wheels in a diagonal position, so as not to enter the water in a line parallel with its surface, but diagonally in one direction, and by placing the other half of the number of the paddle boards so that they shall enter the water in the reverse diagonal direction, as shown by the annexed drawings. Figure 1 is a side elevation, and figure 2 an end elevation of a paddle wheel haivng my improvement applied; from these figures it will be seen that the paddle boards, instead of standing at right angles to the rims of the wheels and parallel to the axis of the wheel, as in wheels of the ordinary construction, are placed obliquely to the rims and to the axis of the wheel. The angle which the paddle boards should form with the axis may vary from 30° to 60°, but I prefer the mean of these two angles, viz., an angle of 45°. I have already stated, and it will be seen by the figures 1 and 2, that the paddle boards do not all incline the same way, but that half of the number incline in one direction and the other half in the opposite direction. In large paddle wheels the oblique positions *of the paddle boards may vary four times in* the revolution of the paddle wheels instead of twice.

As relates to my improvements in propelling vessels, I do not lay claim to the use of paddle boards entering the water in a diagonal or feathering direction, that not being new, but I claim as my invention the making of about one half of them to enter the water in one diagonal direction, and the other half to enter it in the reverse diagonal direction or in large paddle wheels in making the boards to change their direction of entering into the water four times during the revolution of the paddle wheels instead of twice; thus about a fourth part of the paddle boards may enter the water in one diagonal direction, the next fourth part or thereabouts may enter it in the other diagonal direction, and so on, changing their direction four times as above stated during one revolution of the paddle wheels instead of twice.

LOSS OF LIFE BY FIRE. MR. WIVELL, AND THE FIRE SOCIETY FOR PREVENTING LOSS OF LIFE BY FIRE.

Sir,—The subject of escape from fire and again become invested with a fresh and melancholy interest—by the death of three individuals in their burning habitation, under circumstances, that seemed almost to preclude the occurrence of such a catastrophe. This distressing event took place at an early hour of the morning, in one of our most public throroughfares, within a few hundred yards of one of the London Fire-establishment Engine-stations, and in the immediate vicinity of a Fire-escape station of the Humane Society—and yet, from a series of the most unaccountable blunders, three individuals perished in the flames.

There are several points in Mr. Wivell's last communication (page 380) on the subject of escape from fire, that call for more than reproof. In the first place, with respect to Mr. Wivell's unaccountable assertion, that the Humane Society have come to the conclusion, that Mr. Wivell's invention is the "only efficient escape"!

Having written to Mr. Spring, the secretary of the society referred to, informing him of Mr. Wivell's statement, and requesting to be informed if the society had really come to such *a conclusion,* or had expressed any opinion warranting such an assertion—I received the following reply :—

Sept. 15, 1837.

Dear Sir,—In answer to your note of the 11th inst., I beg to say, that the committee are not aware of the publication to which you allude, but at their next meeting, which will take place early next week, I will introduce the subject to them with your letter, and receive their instructions for an answer,

I remain, your obedient servant,

(signed) W. Spring.

48, Great Portland-street.

To Mr. Baddeley.

Accordingly on the 22d instant I received an authorised answer from the committee, in the following terms :—

Society for the Protection of Life from Fire.

Sept. 21, 1837.

Dear Sir,—In reply to your note of the 11th inst., I am instructed by the Committee to inform you, that the Society have not pledged themselves to the general adoption of any particular fire-escape,

I remain, your obedient servant,

(signed) Wm. Spring.

Office 48, Great Portland Street.

To W. Baddeley, Esq.

These communications therefore place either Mr. Wivell—or the "Humane Society" in a very despicable and unenviable position. In a conversation which I had with Mr. Spring a short time since, in answer to a question put to him by me, he stated, that the society would not think of purchasing one of Mr. Wivell's escapes, unless at the especial request of a subscribing district; such a request, I suppose, has now been made, as Mr. Wivell has taken an order to make one for the society at the price of £24!

In the communication already alluded to, Mr. Wivell says, "I have called upon Mr. Baddeley for *his* proof of *his* statement, by a public exhibition of all the society's escapes; but this call Mr. B. has thought wise not to notice." Allow me, Mr Editor, to assure you that I have had no such *call*, and if I had, that I have no power to order a public exhibition of the society's escapes.

"I can call spirits from the vasty deep; but will they come when I do call for them?"

The fact is, that the society did call such a meeting, which was represented in the hand-bills circulated upon the occasion, to be "under the sanction of his *Majesty's Board of Ordnance.*" This public exhibition took place at the Charing-cross Barracks; Mr. Wivell was there, but he did not bring his "Paragon," excusing himself by saying that he had not timely notice. He had much shorter notice of a private exhibition of Mr. Ford's escape in Poland-treet, and also of the fire in Compton-street, where he arrived "in seventeen minutes from Robert-street"!

A member of the Humane Society, attributed the absence of Mr. Wivell's machine, to the ugly building of the Barracks, which being fronted with a deep area and lofty iron railing, and having the windows at a most inconvenient height, rendered the "Paragon" wholly inapplicable. However, the "Paragon" was called, but it came not, and "the only efficient escape" being away, those present had to put on the necessary quantity of efficiency for the occasion.

Having attended many of Mr. Wivell's exhibitions, I can fully comprehend, and readily admit the real merits of his last escape: but happening to be a disinterested observer, I can also perceive what the limits to its powers are, and under what particular circumstances it would be *useful*, and also where *useless*. By carefully computing its claim on the grounds of original cost, current expenses, applicability, &c., as compared with other inventions for the same end, I am bound to repeat that it falls far behind several of them in many respects. On a recent inspection of the Metropolis, with reference to the situation and nature of the buildings, I found the respective *applicability* of the three undermentioned escapes to be in the following proportions, viz.:—

Mr. Wivell's Paragon	80 per cent.
Ford's Spar-escape	94 " "
Merryweather's Ladder-escape	98 " "

This merely refers to possibility of application—*cheapness* and *efficiency* are not taken into account; in these respects, however, "the Bubbles" have it; Mr. Wivell's Bauble being at least four times as costly as either of the others.

"Had not public opinion been with me," says Mr. Wivell, "I should not have claimed a superiority for my invention." So far as public opinion is concerned the matter stands thus :—Ford's Spar-escape has been adopted and purchased by several London parishes; at Liverpool; by the Commissioners of

Woods and Forests, and by them provided to the palaces; it has also been adopted by the St. Pancras Fire Association, and by the Society for Preventing Loss of Life by Fire. The portable fire-escape ladders have been extensively adopted, not only in London, but throughout the United Kingdom, in Russia and America. These ladders are made by Mr. Merryweather, by Mr. Tilley, and by, at least, two other manufacturers, of less note, in great numbers. Mr. Wivell has made *one* escape by subscription, and has disencumbered himself of it by giving it away—and yet in the face of all these glaring facts Mr. Wivell's is "*the only efficient escape*," and *public opinion* is with him alone! Bah!

Mr. Wivell some time ago lectured upon the subject of escape from fire, in the course of which he uttered many truisms that happened to accord with the escapes he was then labouring to bring forward, but having since conceived and brought forth a very different machine, he now eats his own words and makes no bones of bolting the whole edition of his printed and published lectures.

But, "wheel about and turn about" is now getting stale, and the public are not to be gulled, nor burned either, to serve the turn of any individual or collection of individuals, and I shall find it necessary to recur to the proceedings of the Humane Society, at an early opportunity. In the meantime,

I remain yours respectfully,

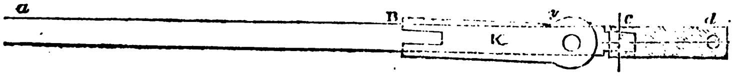
WM. BADDELEY.

London, Sept. 26, 1837.

IMPROVEMENTS IN ASTRONOMICAL CLOCKS. BY W. ETTRICK, ESQ.

Sir,—Various improvements have at different times been proposed by individuals, for decreasing the friction in propelling the pendulum rod of the astronomical clock, by which a freer motion should be given to it. The first improvement may be stated to have been the application of agates. But a considerable improvement was further effected by Mr. Troughton, who, by the application of the horizontal arm running upon a centre, allowed the rod a perfectly free motion in the line of its swing or oscillation. But it will be seen that it is very much tied, nay, not allowed the least motion sideways, which it should have to give it the requisite degree of freedom; for it will readily be seen, that if the line of motion of the crutch is *not* at right angles to the plane, or face of the suspending watch-spring of the pendulum rod, then, and in such case the pendulum would have a tendency to acquire a circular motion, which it undoubtedly would acquire if not prevented by being tied by the crutch. It is obvious that this curbing of the free motion of the pendulum must cause great irregularity in its motion, and should be avoided if it can be effected with a trifling addition to the clock, without increasing the friction. To remedy it, it first occurred to me to use one or two short rods which should, by a centre or centres of considerable breadth, have a motion at right angles to the motion of the pendulum, but none in the other, except with the pendulum itself, to which they should be attached by the broad centre or centres; they being the ends nearest the suspension spring of the pendulum rod, the other ends hanging downwards; the axis (or a line through the centre) going parallel to the axis of the pendulum rod. At the lower end of this or these propelling rods as they may be called, is the centre to which the crutch of the clock is secured, by a steel pin acting as a centre. This arrangement will be much more readily seen by the two drawings, figs. 1 and 2 (on the opposite page), being the method when one rod is used, and fig. 3 and fig. 4, when two are applied on opposite sides of the pendulum rod. Let fig. 2 represent the pendulum, when you see the edge of the pendulum watch spring *cd*. Then *a* B *c* is part of the pendulum rod, and *x* the propelling rod having a free motion from right to left; *y* represents a turned block secured to the rod by solder or otherwise, on which the rod *x* freely works, being secured by a nut or screw *n*. The arm, or rod *m*, is the propelling arm of Troughton, which goes from the crutch of the clock. Fig. 1, which has the same letters attached to the same parts of the pendulum, shows clearly the arrangment. If we now wish to have two propelling rods *x*, the arrangment will be somewhat different as

1



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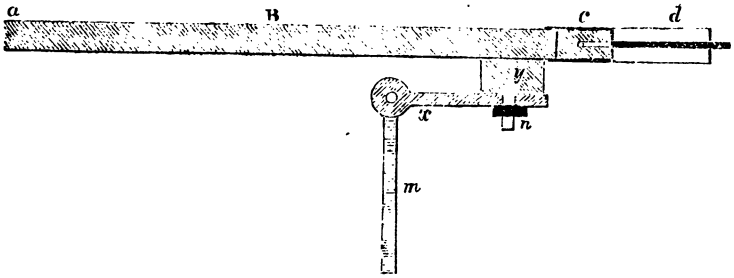
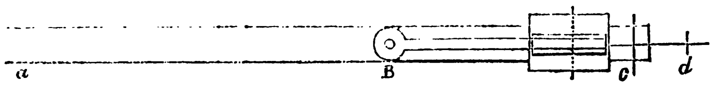


in figs. 3 and 4, where fig. 3 represents the edge view of the watch suspending spring, and fig. 4, the flat side of such spring. *x* and *y* are two arms extending

3



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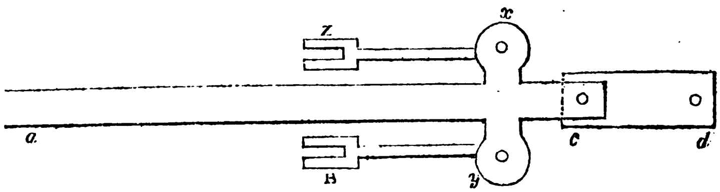


a short way from the pendulum, having bosses and centres for the propelling rods *z x* and *y* B to work from right to left in fig. 4. In the forks *z* and B, Troughton's propelling rod must work, but of course formed forked, to suit the forks *z* and B which is shown at fig. 5. To a clock which I constructed five years since, I applied a modification of this plan, which consisted of springs, instead of arms moving on centres: it was as in fig. 6, (next page):—*c d*, the watch suspending spring, *a b* and *ef*, the two springs of considerable breadth, but very thin and slender, so as to give or move freely in the flat side, but be perfectly inelastic edgeways, which is the direction we now view them. At *f* and *b* are bosses or rises to prevent the pin holes from wearing away rapidly. The Troughton's propelling arm, *x y z* is here formed forked, to adapt it to the spring *a b* and *e f*. It must be remarked, that the fork *x y z* is represented as lying downwards, but is in fact perfectly horizontal in the clock, being here represented so for the convenience of drawing, and showing the whole, which would not have been understood without it. The clock, of which I just now spoke, is placed upon a solid cast iron bracket secured to the wall by bolts going through it. As the form is somewhat different

Fig. 6.

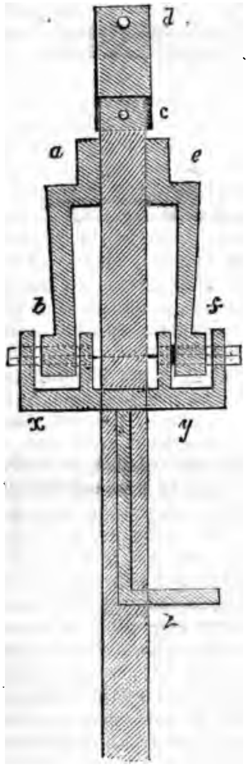
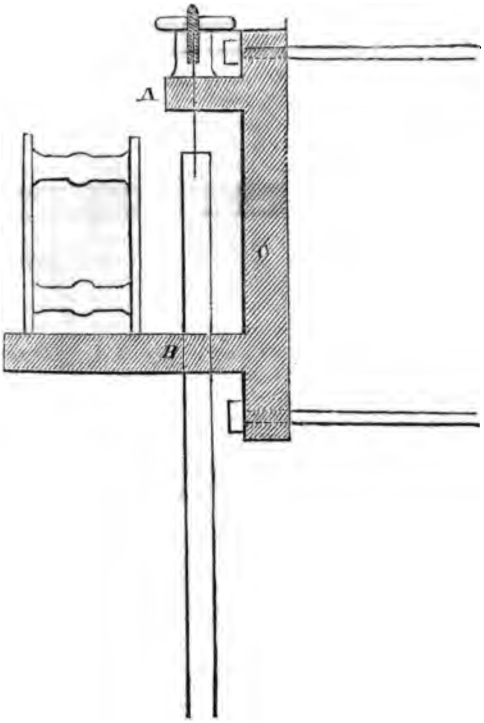


Fig. 6.



from the usual construction, I will draw it to show the advantage of casting it of one piece.

The pendulum in fig. 6 is shown as sus- the pended by its spring from the screw in box, which, resting firmly on the bracket, and the clock on the bracket B, the relative positions of the two cannot alter. One thing I attended to in making the clock, was to have the nuts or screw of the pendulum of the same substance as the rod or male screw, which works in it, as by such caution, the threads of each expand equally by equal degrees, which might not be the case if this were not attended to. For instance, the upper part of the thread of the nut would expand more or less than the lower part of the thread of the male screw if of different metals, and if the threads were not equally distant, would alter the correction for temperature.

W. Ettrick.

August, 11, 1837.

ON THE EFFECTS OF MAGNETISM AND MOTION UPON THE RATES OF CHRONOMETERS. BY CAPTAIN M. WHITE.

Sir,—On perusing one of the numbers of the *Metropolitan Magazine*, which has lately fallen into my hands, I was much surprised to find it there insisted upon, that the gaining rates of chronometers were *in all cases* accelerated, and the losing ones *always* diminished, when on ship board; and moreover, that such acceleration had been owing, solely to the operation of the iron in the ship, because it was said, that when vessels in the Polar regions happened to be beset by ice, as well as when at anchor in shore (and consequently,

supposed to be divested of motion in both cases), the acceleration of their chronometers had still continued. As my present communication is not intended to decry the works of others, but merely to support my own, by making things appear as they really are, and to maintain that character for these truly useful machines, which, when in proper hands, they will so indisputably entitle themselves to, and thereby to second the judicious arrangements of government in their behalf, I beg leave, through the medium of your valuable and widely diffused miscellany the *Mechanics' Magazine,* to offer a few remarks on this subject, under the conviction, that had the direction of the ship's head been always carefully consulted on these occasions, together with the spot where the watches were located, and how the poles of their respective balances (I speak of steel balances), were situated in regard to the hour line of XII and VI as connected with the ship's head, (for under one or the other of these points the sensitive pole of the balance must always be found,) such a sweeping opinion with respect to the iron in the ship, would never have been pronounced, for to say the least of it, it appears to me, as much at variance with the theory of magnetism, as it is altogether opposed to the practice of it; and is therefore calculated to engender a greater degree of mystery and distrust in the use and economy of these beautiful instruments, then the natural order of things would seem to justify. It is well known that the influence exercised by local attraction upon the north pole of the needle, on the northern side the equator, is transferred to the south pole thereof, when on the southern side; and that the energy of local attraction increases as the ship approaches the pole, and decreases as she recedes from it. There must therefore be some intermediate position, during the progress of the ship from one hemisphere to the other, when the operations of local attraction *cease altogether;* and this state of neutrality can exist nowhere, except upon the magnetic equator, where also, be it remarked, the variation of the needle is least generally, because the directive influence of the poles is there greatest. It cannot therefore be maintained, with any show of reason, that the iron in a ship has anything to do with the rate of a timekeeper, *so long as the ship remains in the vicinity of the magnetic equator;* and that consequently, the notion of universal acceleration, from that source at least, at once falls to the ground, even if nature failed to supply us with other instances against it. The experiments set on foot by those ingenious mechanicians, Messrs. Arnold and Dent, for investigating the effects of polarity on the rate of a timekeeper, must be considered as applying altogether to terra firma, and to the latitude and longitude of London, where, in fact, the ordeal took place; they are nevertheless unanswerable as far as they go. When blended, however, with the vicissitudes incidental to water carriage, they will assume a much more complicated character, for there, the balance has to contend, not only against the operation of the terrestrial and local attraction, of themselves continually varying in intensity, as the locality of the ship varies, but against those also arising from the concussion of the ordnance, and the rolling, pitching and lurching of the ship, the momenta of which are as perpetually changing in different ships, and even in the same ship; for however lightly the effect of motion upon the rate of a timekeeper may have been treated hitherto, by those who consider themselves proficients in such matters, the practical and mischievous consequences thereof are as evident as the sun at noon. Nor has all this been unnoticed by Messrs. Arnold and Dent, for they state unequivocally, that a removal only from London to Greenwich, has produced an alteration of 2″ per diem., in the rates of some of their best chronometers and this they attribute to the effects of horizontal motion, which in some cases actually does accelerate, though *not in all;* and although I admit, that the acceleration, or retardation, thus casually created, does no injury to the steadiness of the rate when the cause is removed, yet the mischief is, that the rate thus surreptitiously acquired from the ship's motion, *does not* again recover, as it generally does in the case of magnetism, but is in most cases, adopted by the watch, and must therefore be carried forwards to a fresh account.

If such then be the liability of a chronometer to derangement when on shore, where the effects of motion can to a certain degree be controlled, how are we to escape the consequences thereof when at

sea, when the extremities of a ship, of a small ship especially, enjoy about as much tranquility in rough weather, as the piston of a steam-engine when in full play.

That chronometers going from England to the North Pole, or from the Cape of Good Hope to the South Pole, should increase their gaining rates, and diminish their losing rates, *independent of the ship's motion,* is a question, by no means difficult of solution, for, so long as that part of the balance which possesses polarity coincides with the magnetic meridian, and also with the direction of the ship's head, they cannot do otherwise; and for precisely the same reason, will they decrease their gaining rates, and increase their losing ones, on their passage from the poles towards the equator. I am quite aware that a vessel may be so situated, *even* between the tropics, as to produce a constant acceleration in the rates of her timekeepers, but to generate such an effect, her *head* must invariably incline towards the nearest pole, and the particular part of each balance possessing northern or southern polarity, (as the vessel may happen to be northward or southward of the equator,) must coincide with the direction of the ship's head, for in such a position only will the local attraction combine with the magnetism of the earth, or the influence of these two forces operate in the same direction. And as in such a case the magnetic pole of the balance continually strives to approach the point of quiescence, during its oscillation, the range of the semi-arcs of vibration will in a corresponding proportion be decreased, and the watch must in consequence, gain. Reverse however the position of the ship, without interfering with that of the watch, and results the very contrary will take place; because that part of the balance endowed with polarity will then be placed in opposition to the contiguous pole, and will consequently experience the effect of repulsion when receding on either side the point of quiescence. The semi-arcs of vibration therefore, which in the former case were accelerated, will in the latter be retarded, and the watch must inevitably lose. The possibility, however, of constructing more cases than one, which may prove in some degree at variance with the principles I have laid *down, I do not deny,* but I know also that such phenomena can only be elicited through the medium of artificial agency, the combinations of which are neither to be sought for, nor expected in the ordinary operations of nature.

We know that any extraordinary terrestrial convulsion, or forcible discharge of atmospherical electricity, will in some cases not only destroy polarity, but actually invert it, and in others will communicate polarity where none existed before; the presence of the aurora also, has been frequently observed to shake the foundation of polarity, yet neither the loss, the subversion, nor the regeneration of polarity will afford any argument whereon to establish the fact of universal acceleration in the rate of a watch, whatever they may do in favour of universal aberrations.

That such of the above anomalies as depend altogether upon the influence of magnetism, will be considerably diminished by the improvements lately proposed by Messrs. Arnold and Dent, there cannot be a doubt of, inasmuch as the properties of magnetism, are more difficult of excitement, and less permanent when excited in brass and platina, than in iron and steel; nevertheless, all metals inherit this property in a greater or less degree; and magnetism and electricity occasionally present themselves so unexpectedly, and under such subtle appearances, and are, moreover, so disguished and diversified by local circumstances, as to elude the analysis of the most skilful experimentalists; no precautions therefore can well be deemed superfluous, in any case where the operations of either are suspected, and more especially when the object is a chronometer. And this consideration leads me to inquire, whether the keen and penetrating effects of continual congelation in the arctic and antarctic regions upon the machinery of a chronometer, and the continual presence of electrical phenomena there, have been hitherto sufficiently appreciated? Whether also it can be taken for granted, that the artificial dispositions usually made therein, to counteract the *ordinary* extremes of temperature, in the lower latitudes, are such as to secure corresponding consequences in those *extraordinary* natural contingencies which appertain to latitudes near the poles?

M. WHITE, Capt. R. N.

Jersey, Sept. 10, 1837.

PROCEEDINGS OF THE LIVERPOOL MEETING (BEING THE SEVENTH) OF THE BRITISH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

President—EARL OF BURLINGTON.

September 11—16, 1837.

(Select notices, extracted and abridged from the Reports in the Athenæum of the 16th and 23d of September.)

(Continued from p. 456, vol. xxvii.)

Mr. William Ettrick then proceeded to give a description of an Artificial Horizon.

He first described three methods already known, that by the peg or humming top,—the spirit level, described at the Edinburgh meeting,—and another, as given in the *Mechanics' Magazine* of July last. He then shewed the imperfections to which these instruments were liable, and some methods by which they might be obviated. Mr. Ettrick stated that a discovery of Lieut. Beecher, R. N., involved part of the principle now described, but he claimed for himself the priority of the invention, having tried the instrument on the 15th of October, 1836, and having in his possession several letters in proof of this fact.

Professor Henry, of New Jersey College, Princeton, U. S,, then addressed the Section, and said, he had been requested to present to the Association a map of the United States, in which were marked the railways and canals completed and in progress. There were now 1,500 miles of railway in operation in the United States, and 2,000 miles of canals; and 3,000 miles of railway are in progress, which have been in a great degree interrupted, owing to the late commercial convulsion. In answer to a question put by Mr. De Butts, he stated, that, on the Hudson, there being very little current, 150 miles were frequently accomplished by the steam-boats in nine hours.—Dr. Lardner much doubted, whether a speed of 15 miles an hour could be generally attainable. [See on this point a letter of a Manchester correspondent in our last Number, p. 430]. Mr. Webster stated, that Mr. Blunt, an American engineer, had, in a pamphlet which he quoted, declared, that the American boats had accomplished 74 miles in five hours, and that the distance from New York to Albany, 150 miles, was performed in ten hours by boats built principally with a view to speed.

SECTION A.—MATHEMATICAL AND PHYSICAL SCIENCE.—SECOND SITTING.

Dr. Robinson read a Report of the Determination of the Constant of Lunar Nutation from a discussion of the Greenwich Observations.

The author commenced by giving a sketch of the commencement of accurate astronomy, under the auspices of Bradley, by his brilliant discoveries of the aberration of light and the nutation of the earth's axis, demonstrating, that a degree of precision until then deemed unattainable in astronomical observations, was perfectly possible. The impulse then given has not ceased to affect the movements of astronomical discovery. Yet from his day, it must be acknowledged, that, in regard to both aberration and nutation, nothing was added to the researches of Bradley, until within a few years, when Struve, Brinkley, and Richardson resumed the inquiry. He then sketched the progress of each of these, and stated, that the constant of nutation deduced by Brinkley was that generally adopted by British astronomers. In Germany, however, the authority of Bessel had introduced and given currency to a different value for this important element of calculation, deduced from the calculations of Von Lindenau; and although the two values differ only one-fourth of a second, which is less than the millionth part of the length of the telescopes generally used in observing; yet such is the accuracy required in the modern researches of astronomy, that even this evanescent quantity of error is considered as a disgrace. This stigma, he trusted, was now removed by the work which the aid of the British Association had enabled him to perform.

Dr. Robinson then referred to the labour of reducing observations, as actually taken, in consequence of the refraction of light, the aberration of the stars caused by the progressive propagation of light, the proper motions of the stars, and the united effect of all the movements impressed with the earth upon the actual place of the observer. Of these, the impressions upon the axis of the earth are pre-eminent, and the largest of them in amount has been long known under the name of the Precession of the Equinoxes; this is well known both as to its laws and amount; the remaining three are termed Nutations, of which one completes its course in a fortnight, and is never so large as one-tenth of a second; the theory of this is sufficiently known; a second completes its cycle in half a year, and, when greatest, may amount to half a second, and has been separately determined by the admirable observations of Dr. Brinkley: the third is the largest in amount, being about

nine seconds, and completing its cycle in the time of a complete revolution of the moon's nodes, or about eighteen years, rather more: the exact determination of this was the object of the discussion of the observations of which he was now giving an account. He then proceeded to give a general description of the method of employing the observations, and the kind of observations to be selected for this determination, shewing that it was most important to have a complete series of observations extending through the entire period of the moon's nodes, made with the same instruments, and, if possible, by the same observer, or at least with the same system of observation. The observations made at Greenwich under the superintendence of the late Mr. Pond were those selected. The tables of Bessel were used; his values of declination, nutation, and proper motion were used, but Dr. Robinson has used his own values of aberration and refraction. Upwards of 4000 observations of the pole-star above were used, and in the results more than 2000 above and below were combined to give the zero of polar distance; the others were used to watch for and detect any change in the instrument. He then stated the principle on which the other stars were selected, to be, that their altitudes secured them from uncertainties in refraction, and that they should be such, that at least two-thirds of the nutation should exist in the direction of their polar distances; of such stars, fifteen were in the Greenwich Observation, but some of these could not be used. They afforded about 8000 results, but 6000 only were used; an accident which occurred to the instrument in 1820, rendered useless about 1000 of them. The mean results of these observations being taken with the precautions which the paper pointed out at length, the results of some required that the value of Lindenau, which is 8″.977, should be increased, while others required that it should be diminished; on the whole, an increase of 0″.257 was acquired, giving the result 9″.234, which differed only by sixteen thousandths of a second from the number selected by Mr. Bailey, and used in his invaluable Catalogue. The learned author then proceeded to notice and remove certain objections which, he anticipated, might be made to the details of his method of reduction; in the course of these he stated, that as the corrections of Bessel's proper motions which his work has given, are all, except in one instance, negative, he inferred that the Greenwich circle was undergoing some progressive change of figure, making it shew polar distances too great for about 30° south of zenith. If this were so, he observed, the sagacity of Mr. Airy would not permit it to be long undetected. He then read a table from these observations, shewing that the declinations as obtained from his calculations, though they differed materially from those given by Pond himself in the Nautical Almanac for 1833, yet agreed closely with those of Bessel, thus shewing, that the difference between these Catalogues arises solely from the different methods of reduction, and exciting the wish, that the British Association might lend its aid in reducing the whole of the Greenwich observations made by Pond.

Mr. Bailey congratulated Dr. Robinson on the successful termination of his labours. He stated, that it was a curious fact, that Busch, of Berlin, had, from a series of observations made by Bradley, at Wanstead, before he removed to Greenwich, computed the nutation, and given its value 9″.2347, thus differing by only 7 ten-thousandths of a second from the value deduced by Dr. Robinson, although the cycle of observations was different; the instruments and places of observations, and the observers, were all different: this was a coincidence scarcely to be equalled in the annals of science.

Mr. Russell presented the Report of the Committee on Waves.—Mr. Robison and Mr. Russell, of Edinburgh, had been appointed at the Bristol Meeting of the British Association a Committee to prosecute an inquiry concerning the Mechanism of Waves, in which Mr. Russell had been previously engaged, and to extend their observations to the determination of the effect of the form of channel, and of the wind upon the tidal wave. Mr. Lubbock and Mr. Whewell had already determined, by their investigations, the laws of the propagation of the oceanic tide, but it still remained to assign the law of propagation of the tide in those shallow seas and rivers, where the bottom and sides of the channel exercise the principal influence on the propagation of the tidal wave.

The following are some of the results of the inquiry:—

It appears that there exists a species of wave different from all the others, and which Mr. Russell calls "The Great Primary Wave of Translation," which is generated whenever an addition is made to the volume of a quiescent fluid, in such a manner as to affect simultaneously the whole depth of the fluid, and this species of wave is exactly of the same nature as the tide wave. In a rectangular channel, this primary wave moves with the velocity which a heavy body would acquire in falling through half the depth of the fluid, so that

In a channel about 4 in. deep, the velocity of the wave is nearly 2 miles an hour.

—	12	—	—	4	—
—	2 feet deep		—	5½	—
—	3	—	—	6½	—
—	4	—	—	7½	—
—	5	—	—	8½	—
—	6	—	—	9½	—
—	7	—	—	10 1-5th	—
—	8	—	—	11	—
—	9	—	—	11½	—
—	10	—	—	12 1-5th	—
—	15	—	—	15	—
—	30	—	—	20	—
	&c.			&c.	

It also appears, that the breadth of the channel, when the depth is given, does not at all affect the velocity or form of the wave.

Professor Powell then read a paper "On Von Wrede's Explanation of the Absorption of Light by the Undulatory Theory."

Von Wrede supposes the particles of a transparent body placed regularly at equal distances, and the ether being diffused between them, a ray of light is propagated directly through the medium, but a portion of each wave encounters some of the particles, and is reflected backwards; then forwards again, and emerges along with the direct ray; and from the retardation it has undergone, it may interfere so as to produce darkness, if the retardation amount to an odd multiple of the half-wave length, but brightness if an even multiple of that quantity. These effects may be confounded together in white light, and by prismatic analysis they will be seen as dark bands.

Sir D. Brewster conceived, that the theory of Von Wrede was entirely inadmissible.—He stated many cases of absorption, where there was not an appearance of reflection, as in the case of nitrous gas, which, by mere changes of temperature, became as black and as impenetrable to light as charcoal. Sir John Herschel had also noticed many cases of absorption without any trace of reflection; and only in the cases of some vegetable colours did he ever experience the contrary.—Professor Lloyd asked whether the changes might not result from partial changes of density caused in the substances by changes of temperature?—Sir David Brewster stated, that it was impossible there could be any change of density in the case of the nitrous gas, as the changes in its temperature took place while its volume was secured from enlargement by its being sealed up in glass tubes. At one time he was inclined to think, that some chemical change might have been effected upon the glass, but the phenomena did not long warrant this conclusion. The phenomena of absorption could be all had from plates of partially decomposed glass, such as that which had been long buried in the earth, but this was a case of real opalescence.

Sir W. Hamilton then gave an account of His Exposition of the argument of Abel, respecting equations of the fifth degree. Sir William stated, that the celebrated young Swedish philosopher, Abel, whose labours (unfortunately for the cause of science) had lately terminated with his life, had at one time supposed that he had found a method of solving generally equations of the fifth degree; but soon finding that this solution was illusory, it occurred to him that perhaps, under the conditions of ordinary algebra, such a solution was an impossibility; as soon as he had started this thought, he pursued it through a most intricate argument, and at length achieved what any one, upon first hearing it, would be apt to consider most chimerical—an *à priori* argument to prove, that the solution of an equation of the fifth degree was, under the limitations of ordinary algebra, an impossibility.

Mr. Peacock observed, that the Section were scarcely aware of, and could not be too strongly impressed with, the value of an attempt like that of Sir W. Hamilton, to render this celebrated argument of Abel intelligible to beginners, and even to advanced students in algebra. The constitution of most minds was such that they were anxious to run away from those subjects on which their labours could be profitably employed, and to engage themselves in the prosecution of curious, and sometimes almost useless, difficulties. He exemplified the celebrated resolution of the Academy of Sciences of Berlin, that they would in future receive no more communications on the subject of squaring the circle, as a remarkable proof of the extent of this morbid state of mind, for it was a fact, that the average number of communications on this subject, when taken for many years, amounted to four annually. The rage for solving mere algebraic difficulties was pretty much the same, and he, therefore, for one, felt that the gratitude of men of science was due to Sir W. Hamilton for thus giving an *à priori* argument, the obvious tendency of which was to save the laborious exertion of talent in fruitless research, a labour for the employment of which such vast regions were at present opening before us in rich profusion.

Mr. Henwood made a communication "On the relative Temperature of Slate and Granite." Mr. Henwood had had access to various mines in Cornwall, varying from 20 to 240 fathoms in depth, and had made numerous experiments on the temperature of the several rocks by means of the streams of water issuing from them. In every case he found the granite to be 13.°9 colder than the slate at the same depth; but the rate at which the temperature of the slate dimi-

nished in descending was considerably slower than the rate at which the temperature of the granite diminished, the one being 1 degree in 60 fathoms, the other, 1 degree in 65 fathoms.

Sir W. Hamilton now made an exposition of Mr. Turner's theorem respecting the series of odd numbers, and the cubes and other powers of the natural numbers.—Sir William stated, that if you take the series of odd numbers and divide them into groups, as below, of one, two, three, &c. terms, consecutively, the sums of these groups furnish the cubes of the natural numbers, as follows:

1	3 5	7 9 11	13 15 17 19
Sum=1	Sum=8=2^3	Sum=27=3^3	Sum=64=4^3

And a theorem of a general kind could thus be stated: any power, n^m of any number n= sum of n consecutive odd numbers, the extremes being the sum and the difference of the next less power n^{m}—^{1}, and the next less number n—^{1}. For example, the 5th power of 3 is the sum of the three consecutive odd numbers, of which the extremes are the next less power, namely, the fourth power of 3 or 81, and the next less number or 2, these extreme odd numbers being 79 and 83; the sum of all is $79+81+83=243=3^5$.

Professor Stevelly stated, that there was another curious property of the natural numbers, and their cubes, which he was not aware was generally known: it was this, that if you take a set of weights denominated by any number of the natural series of numbers and of their cubes, you can with these weights, by occasionally using some in one scale and some in the other, weigh up to the weight expressed by the sum of all used; thus,

1	2	3	4	5	&c.	natural numbers.
1	8	27	64	125	&c.	cubes.

Taking the weights denominated by 1, 2, 3; 1, 8, and 27, and you can with these six weigh any weight up to the sum of all, which is 42.

SAME SECTION.—THIRD SITTING.

Professor Lloyd gave an "Account of the Magnetical Observatory," now in course of erection at Dublin. It is situated in an open space in the gardens of Trinity College, and sufficiently remote from all disturbing influences. The building is 40 feet in length; by 30 in depth, It is constructed of the dark-coloured argillaceous limestone, which abounds in the valley of Dublin, and which has been ascertained to be perfectly devoid of any influence on the needle. This is faced with Portland stone; and within, the walls are to be *studded*, to protect from cold and damp. No iron whatever will be used throughout the building. With reference to the materials, Professor Lloyd mentioned, that in the course of the arrangements now making for the erection of a Magnetical Observatory at Greenwich, Mr. Airy had rejected bricks in the construction of the building, finding that they were in all cases magnetic, and sometimes even polar. Mr. Lloyd has since confirmed this observation, by the examination of specimens of bricks from various localities; and though there appeared to be great diversity in the amount of their action on the needle, he met with none entirely free from such influence. The probable expense of the building and instruments is estimated at 1000*l.*; and that sum was immediately allocated to the purpose by the Board of Trinity College, when it appeared that the interests of science were likely to be benefited by the outlay.

Mr. Peacock informed the Section, that an observatory for magnetical observations had been erected at Greenwich,* and that little doubt need be entertained of the rapid advances whieh the interesting investigations connected with this important science would now receive.—Mr. Ettrick conceived, that bricks would be a very improper material for the construetion of a magnetical observatory. He considered the use of metals in any part of the building as highly objectionable; even copper as fastenings or hinges to doors, would not be free from injurious effect.—Professor Stevelly said, that Mr. Ettrick was unquestionably right in the objection urged against the use of bricks, but Professor Lloyd had distinctly stated, that bricks were not to be used, and that experiments had been made to ascertain the precise magnetical influence, if any there was, of the kind of stone which it was proposed to use. It was well, however, that Mr. Ettrick's observations should go abroad, for the guidance of persons not conversant with these subject. Bricks, when built into large edifices, such as the chimneys of factories, were well known to have acquired magnetic polarity: the material from which they were made must be largely impregnated with iron: the mud of rivers was the detritus from hills, whose rocks were often highly magnetic. The engineers employed on the trigonometrical survey of Ireland, had erected a mound of stones composed of basalt, to sustain the signal-staff which they had erected on the highest hill, near Belfast; the effect of that heap of stones on the magnetic needle was so great. that in walking round it the needle would veer round to every point in the compass.

M. de la Rive read a paper "On the Interference of Electro-magnetic Currents."

* See *Mechanics' Magazine*, No. 736, p. 400.

M. de le Rive read a second paper "On an Optical Phænomena observed at Mont Blanc." When the sun has set at Geneva, it is observed that Mont Blanc remains illuminated by its direct rays for a much longer time than the surrounding mountains. This phænomenon is owing to the great height of Mont Blanc. But, after it has ceased to be illuminated, the summit of Mont Blanc sometimes reappears at the end of ten or fifteen minutes, less intensely enlightened than at first, but nevertheless in a manner very decided, and often very brilliant. This phænomenon takes place especially when the atmosphere is very pure—highly charged with aqueous vapour in an invisible state—and, consequently, very transparent. The author has satisfied himself (by the exact observation of the time which elapses between the two successive illuminations of the mountain, combined with the calculation of the sun's progress) that the phænomenon is due to the rays of the sun which traverse the atmosphere at a distance from the earth less than the height of Mont Blanc, but greater than half that height, and which arrive at rarer regions of the atmosphere under an incidence so great that they are reflected instead of refracted. This interior reflection is facilitated by the humidity of that part of the atmosphere which the rays traverse until they reach the point of incidence. The reflected rays falling on the snowy summit of Mont Blanc, produce this second illumination; and the humidity (by augmenting the transparency of the air) renders the illumination more brilliant.

Sir D. Brewster stated, that he had witnessed a similar effect, though on a less magnificent scale, on the Grampian Hills; but he had always observed, that on such occasions the sun set in a red west, and that all the clouds in that quarter of the heavens were then red.—M. de la Rive replied, that the phænomenon he spoke of only appeared when the sky was quite free from clouds, and, in truth, it was most brilliant when the air was very transparent in consequence of its being loaded with vapour in its elastic state.—Professor Lloyd said, that the distinctness and vividness with which distant objects were seen in some states of the atmosphere was quite astonishing; on one occasion, he had seen from the neighbourhood of Dublin the Welsh hills from their very bases, and brought so near apparently, that he could absolutely see the larger inequalities of the surface upon the sides of the mountains. That the atmosphere was at time very much loaded with vapour in a highly transparent state, was obvious from the fact, that immediately after a very heavy fall of rain took place, and continued for a considerable time.—Professor Stevelly wished to confirm what had fallen from Professor Lloyd and M. de la Rive, by stating, that that whenever the Scotch hills appeared with that peculiar vividness and distinctness from the Lough of Belfast, the fishermen always looked upon it as a sure precursor of heavy rain and wind. A friend had informed him, that on one occasion he had noticed this appearance while standing on the beach at Hollywood, and pointed it out to an old fisherman; the old man immediately gave notice to all his friends to whom he had access, who instantly set about drawing up their boats and placing their small craft in more secure places; early the next morning a violent storm came on, which did much damage on the coast, to those who had not been similarly forewarned. Thus we find that the most interesting pursuits of the man of science, and the most important concerns of man in the practical details of life, frequently approach, and each may lend important aid to the other.—Mr. Lubbock was of opinion that the principal fact mentioned by M. de la Rive would receive a simple solution, if we admit the theory of Poisson regarding the constitntion of the atmosphere. That eminent mathematician conceived that analysis led irresistably to the conclusion that the upper portions of the atmosphere were, by the extreme cold there existing, condensed into a liquid, or even into a solid: if this were so, we could easily conceive how the reflection of the light from its under surface would re-illuminate the top of Mont Blanc after the direct light of the sun had ceased to reach it.—Sir David Brewster expressed much surprise at hearing, for the first time, of this theory of Poisson, and that he should feel much obliged to Mr. Lubbock if he would give some details of it in a separate communication to the Section; and he had little doubt but that it would be as new and as acceptable to many gentlemen as to himself. He thought that the near apparent approach of distant objects in certain states of the air, as mentioned by Professor Lloyd and Professor Stevelly, might perhaps be accounted for by supposing that on these occasions the intervening air became actually converted into a large magnifying lens.

Major Sabine then made a "Report upon the Variations in the Intensity of Terrestrial Magnetism at different parts of the surface of the Earth."

The Rev. Mr. M'Gauley read a paper, "On a convenient and efficient form of Electro-magnetic Apparatus for the production of Electricity of High Intensity," and experimented with the machine before the Section.

Mr. Holden made a communication respecting the "Atmosphere of the Moon." He stated, that many observations he had made upon the moon, convinced him that that luminary was surrounded by an atmosphere, although it was the ordinary opinion that she either had no atmosphere, or one of such extreme tenuity, as to be practically none.—Professor Stevelly, Mr. Peacock, Mr. Lubbock, and Sir David Brewster, all expressed opinions unfavourable to the views of Mr. Holden.

Lieut. Morrison gave a description of an instrument for Measuring the Electricity of the Atmosphere. It consists of a glass cone about four inches in diameter at the base, surmounted by a brass ball, and a wire about two feet in length. Within the glass is a small magnet, suspended by a gold thread, attached to the lower extremity of the wire. The use of this was to collect the atmospheric electricity according to the commonly received views. The action of the electricity, Lieut. Morrison said, was shewn by a deflection of the needle, the *direction* of the deflection indicating the kind of electricity and the *amount*, being an index of the intensity of the electricity of the atmosphere at the time of observation; when that was positive, he said that the needle would be deflected to the east, when negative, towards the west. In some instances, he had known it to be deflected quite round to the south. He detailed a number of observations which he had made in various places, and spread over several months, in which 94 times in 100 the instrument detected electricity in the air.

Several questions were put to Lieut. Morrison, tending to a clearer understanding of what he stated to be the action of the instrument. It seemed to be the general opinion, that the action of this instrument depended on some other agency than common electricity. In reply to a question from Mr. Addams, Lieut. Morrison stated, that if the conducting wire were electrified by a common machine, no deflection of the needle would take place. This seemed to be decisive.

SECTION B.—CHEMISTRY AND MINERALOGY.—THIRD SITTING.

Mr. Black communicated a paper "On the Influence of Electricity on the processes of Brewing." According to his statements, a thunder-storm not only checks the fermentation of worts, but even raises the gravity of the saccharine fluid, and developes in it an acid. This effect is principally witnessed when the fermenting tun is sunk in moist earth, and may be obviated by placing it upon baked wooden bearers, resting upon dry bricks or wooden piers, so as to effect its insulation. Mr. Black also stated, that during the prevalence of highly-electrified clouds, the fabrication of cast-iron does not succeed so well as in other states of the atmosphere.

Dr. Apjohn next exhibited a new variety of Alum, found on the eastern coast of the African continent, about midway between Graham's Town and Algoa Bay. It occurs in fibrous masses, very similar to asbestos, having a beautiful satiny lustre, and splitting into threads which would appear to be quadrilateral prisms. In taste, solubility in water, and relation to several re-agents, it closely resembles ordinary alum, but is distinguished from it by containing protoxide of manganese, instead of an alkali, and by not assuming the octahedral form.

This communication gave rise to much discussion. Dr. Faraday stated, that a specimen of the mineral in question was given to him in London, that he had found it to contain oxide of manganese, and that on this account, and because of the absence of an alkali, he hesitated to admit it as a true alum; and that supposing, as conjectured by Dr. Apjohn, a double salt should be formed, in which the alumina and alkali of ordinary alum were replaced by equivalent quantities of the deutoxide and protoxide of manganese, he could not admit it to be considered as an alum at all.—Dr. Clarke took up a different ground, and objected to the term alum being applied to the salt in question, inasmuch as it could not be made to assume the octahedral form.—To the first objection, Dr. Apjohn replied, that he considered the mineral he had examined to be an alum, because, according to his analysis, its composition accorded with the general formula for alum; and, to the second, that the other well-known alums presented other difficulties of as great magnitude as respects the laws of isomorphism. For example, soda alum crystallizes as an octahedron, though soda is not usually considered isomorphous with the other alkalies; and that, though the different varieties of alum assume the same form, they are not by all chemists considered to contain the same amount of water of crystallization.—Professor Johnston concluded the discussion by suggesting, that the difficulties which had arisen might be easily surmounted, simply by gentlemen agreeing upon a definition of what did or did not constitute a true alum.

(To be continued).

EXCURSION TO THE NORTHWICH SALT MINES BY THE BRITISH ASSOCIATION.

Mr. Deck, the intelligent practical chemist of Cambridge, has published the following interesting narrative:—

To the Editor of the Cambridge Chronicle.

Sir,—Being one of the favoured few of the members of the British Association, during its late meeting at Liverpool, who were included in the geological excursion to the Marston Salt-mines at Northwich, I feel anxious that a more explicit detail should appear than has yet been given of the very liberal conduct of the proprietors, and the extreme interest and novelty of the excursion. As the number was obliged to be limited, about 60 from a long list of members who had entered their names were selected out, and at eight o'clock on Saturday morning last they assembled at the Railway station, where a beautiful locomotive engine, "The Spitfire," and a train of carriages, were placed at their disposal by the Railroad Company; and, in the space of one hour and ten minutes, it arrived in great style at the Hartford station, a distance of 32 miles, being the nearest point of the road to Northwhich. Here carriages of all descriptions were provided by the liberality of the gentlemen through whose kindness this delightful trip emanated, and conveyed the party four miles to the mine, through a country whose thick population were on the alert to view the "*curious larned men*," as they were termed. Every preparation had been previously made by lining the bucket and rope with cloth for a clean and safe descent, which was effected down a shaft of 400 feet by means of steam power, four individuals descending at a time, under the careful superintendence and watchful eye of a principal overlooker. All being safely landed, a scene of wonder and astonishment opened to view that will not easily be effaced from the memory of any one present. The extent of the excavations amount to 50 superficial acres, the principal parts of which were illuminated by upwards of 4,000 candles, tastefully displayed against the glittering rock, and some arranged in devices of "V. R." with a crown, also "B. A." The effect was magical, and the unexpected combustion of some crimson fire and blue lights (which a lover of the pyrotechnic art luckily possessed) upon the sparkling crystals of the mine, brought to mind scenes in the well-known and oft-read tales of *Sinbad* and *Aladdin*; the enchantment of which was much increased by the moving trains of salt, drawn by horses from various parts of the mine towards the shaft, illuminated by candles, in honour of the visit, which produced an extraordinary and beautiful effect. Sixty men are employed, and upwards of 1,000 tons of salt annually raised in these pits. After a gratification, not to be described, in viewing the wonders of these subterraneous treasures, the company were shewn to a part of the mine, where (as if raised by the hand of magic) appeared a most sumptuous repast—a table with every delicacy, and decorated with beautiful flowers, wax-lights, and a profusion of the choicest wines; and it may be believed that, from previous exertion and the extreme novelty of the *dejeuner*, full justice was done to the viands, and the interest of the scene was considerably heightened by the attendance, in such a situation, of four female servants to wait upon the company. C. Worthington, Esq., and T. Firth, Esq., (the spirited and liberal proprietors of the mine), acted as president and vice-president, and proposed the health of "The Queen," with three times three, and which was honoured by the discharge of some small pieces of cannon, the effect of which, reverberating for a considerable time through the extent of the mine, was very striking and extraordinary.

The health of "Professor Sedgwick" was given with great applause, as likewise "Success to the British Association," for which latter toast thanks were returned in a neat and elegant speech, by a gentleman who afterwards proposed "Our excellent and liberal hosts, the proprietors of the mine," with nine times nine; and if gratitude could be evinced by hearthy cheers, it was here most vociferously testified. The compliment was acknowledged by one of the proprietors, who made some beautiful allusions to the situation in which the company were then placed, and suggested that as it would be prudent, from the peculiar journey we had to take, that the head should be kept cool and hand steady, we drank to "Our friends above," and all then adjourned from the festive board, and proceeded to the shaft, where "God save the Queen" was sung by the whole company in full chorus. Just previous to the ascent a Rev. Gentleman in the company most aptly proposed that, as we had sung the praises of our earthly Sovereign, it would not be inappropriate to sing praises to our heavenly one, particularly after viewing the stupendous and wonderful works of His creation, where we were then assembled, and suggested that the beautiful and appropriate lines of

> "Praise God, from whom all blessings flow,
> Praise him all creatures here *below*!"

should be sung. All voices quickly responded to the call, and it was reverently and devoutedly sung to the tune of the 100th Psalm. By the same judicious and careful arrangement all were safely raised to the

surface, and quickly conveyed to the steam-carriages, where instructions were given to shew the effect of railway speed; and in an hour we were delightfully conveyed the thirty-two miles to Liverpool, having effected, in the course of eight hours, a distance of twenty-seven miles, and spent five hours in the mine—concluding an excursion of intellectual enjoyment which will long be remembered with delight by those who were fortunate enough to be present.

I remain, Sir, your's, &c.

I. Deck.

King's Parade, Cambridge, Sept. 21.

NOTES AND NOTICES.

French substitute for Indigo.—Public attention has been latterly attracted in France by the reported perfection to which the discovery of a substitute for indigo has been brought, and by the establishment of dye-works on a large scale for applying the process to the dying of wool and woollen cloths, for which it is more especially suited. This new product is called French blue *(blue de France)*, and its advantages are thus described:—1st. Its colour, in all its shades, is of very superior beauty to anything yet known. 2d. It is perfectly unchangeable by air, acids, soaps, &c. 3d. It never whitens at the seams, like indigo. 4th. It dyes in or penetrates the piece in the most perfect manner, which cannot be done with indigo. 5th. It preserves the quality of the cloth with all its softness and suppleness, without in any way altering the texture or nap. 6th. It facilitates the reproduction of the same shades, which is so difficult with indigo. 7th. Its results in the execution are so sure, that an exact estimate may be made beforehand of the expense and product. 8th. It offers a very considerable saving upon the value of the raw material (prussiate of potash), which is an indigenous product of moderate price, susceptible of reduction to a value still less, and by which, according to the quality of the cloth, it may be dyed at from 25 to 50 per cent. less expense than from indigo. 9th. It is said to be of great advantage for furniture, carriage, and livery cloths, and for tartans, merinos, cachemires, &c., on account of the superior clearness and lustre of its colours. 10th. It produces an economy of 12 to 15 per cent. in the manufacture of the cloth, by the solid application of the colouring matter in piece, which has only been effected till now in black and scarlet. Such are the large results promised by this discovery, which appears to be looked upon by the parties originating it, as well as by several of the first wollen manufacturers of France, as likely to render France independent of foreign countries for the supply of indigo, of which she now consumes to the amount of 20,000,000 francs per annum.—*Times.*

Brick and Cement Beams.—A fresh series of experiments having been trying during the present week at the Royal Engineer Establishment, Chatham, by authority from the Board of Ordnance. Three experimental brick beams, each resting on piers of brick, were constructed and broken by weights, which were applied over the centre of each. The piers were 2 feet 6 inches high and 18 inches square. The beams were 10 feet long, of the same width as the piers, and 1 foot thick. No. 1 beam was built of pure cement. No. 2 was also built of pure cement, with the addition of five longituninal pieces of hoop iron, one of which was in the centre joint, ane two others in each of the remaining joints. No. 3 was built with mortar, composed of three parts clean sharp sand, and one part of Halling Lime, and had also hoop iron in the joints. The wood work for supporting Nos. 1 and 2 was removed in nine days, and that for supporting No. 3, in six weeks after they were finished. No. 1 beam was broken down, but it yielded sooner than it was expected; but it proved that for buildings where beams are usually used it may be safely applied. No. 2 also was a satisfactory experiment. No. 3 was tried on Saturday. The object of the experiment was to ascertain the use of cement-bond in the walls of buildings, as a substitutk for bond and chain timbers; and also for ascertaining what additional strength is added to the bond by using hoop iron in the joints. Mr. Brunel first tried some very interesting experiments, proving the extraordinary strength of brick work, laid in pure cement with hoop iron in the lower joints, but the same thing had not been tried without hoop iron, which led to the experiments under Colonel Pasley.

Captain Rudkin's Distilling Apparatus.—This invention which has for some time occupied the notice of agriculturists, is now about to have a fair and, we suppose, a final trial. The machine has been completed at the government distillery, and will be fixed ready for the experiment in a few days. It is stated that the quantity which will pass through it in one week, will be nearly 1,400 gallons of low wines, and nearly 400 gallons of low spirits, so that the experiment will be on an extensive scale. A contemporary, in noticing the subject, says—"Should the result prove the invention to be what the highest scientific authorities have already pronounced it, there is no reason why every farmer should not become a distiller who feels it his interest to be so."

Belgian and French Railroads.—Brussels, Sept. 17. The receipt of the iron railroad fully justify the expectations that were formed of it. The receipts from a certain period, when only one section of the railroad, that from Mechlin to Brussels, was completed, being ascertained, it was calculated, that when two sections were in use, the amount would be tripled. This might have been thought rather a sanguine expectation, but it has been realized. The receipts for eight months on the first section were 241,456 francs 10 centimes. Triple this sums 724,355 francs 14 centimes. This may be considered as highly satisfactory; for the third section, that to Tersmonde, is of far less importance than those of Brussels and Antwerp. Three new sections will be opened in the month of September, and we shall then see the product of six sections. Sept. 18. We are informed that the commissioners assembled at Arras, to consider the best direction to be given to the iron rail-roads, have nearly agreed on the following basis.—The communications between France and Belgium, Amiens, Arras, and Douai, with a branch from Douai to Valenciennes and Cambrai, and from Lisle to Belgium on the other; to be by a line, which proceeding from Amiens, passing by Abbeville, Estaples, Boulogne, Calais, Watten, St. Omer, Aire and Merville, with a branch from Watten to Dunkirk, would join the principal line at Lisle.—*Brussels Papers.*

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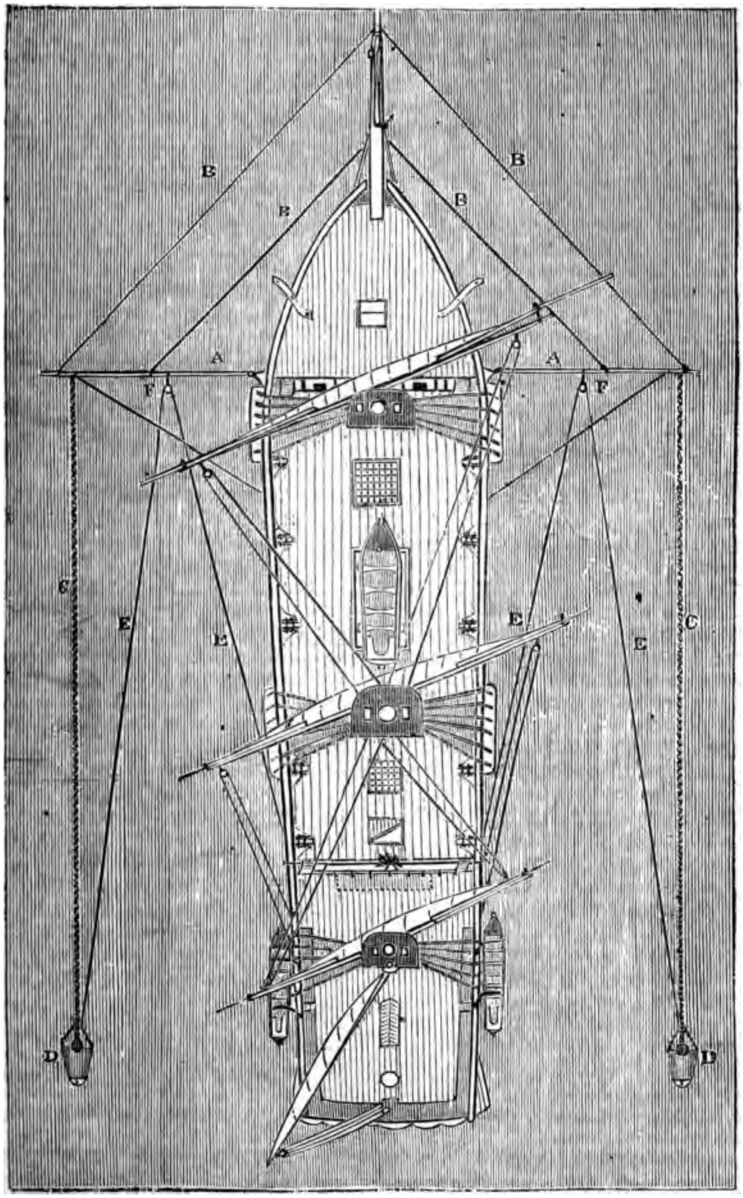
Mechanics' Magazine,

MUSEUM, REGISTER, JOURNAL, AND GAZETTE.

No. 740.] SATURDAY, OCTOBER 14, 1837. [Price 3*d*.



BAKER'S PLAN OF STEERING SHIPS.

TEMPORARY RUDDERS—PLAN FOR STEERING SHIPS BY BUCKETS.

Sir,—In forwarding for insertion in your truly valuable Magazine, the accompanying plan for a temporary method of steering a ship which has lost its rudder, I think I may state, that it is the only one that has, as yet, been invented, which can be got in working order in a few minutes. The importance of this one advantage, if it possesses no others, will be at once evident to your nautical readers and correspondents.

Many plans have been proposed for the government of a vessel after losing her rudder, composed of sails, ballast, masts, spars; even rope has been proposed by a boatswain in the Royal Navy. Steering a vessel, however, by most of these plans is generally attended with an immense increase of manual labour; they also take a long time to get ready, and, as will be seen by the Pakenham, are expensive affairs. Even with these drawbacks, some of them have proved exceeding valuable, and are therefore worthy of being more generally known; I shall therefore, with your leave, introduce to the notice of your readers sketches of the best of these plans with the inventors' own descriptions.

The Pakenham rudder, fig. 1, consists of an inverted topmast A, the fid hole being uppermost to receive the tiller; *b*, a spare lower cap fitted to the stern post to act as a brace, with two hawsers or spare chain topsail sheets, made fast to eye bolts, one on each side of the cap, and then passed under the ship and brought inboard at the hawse holes, and hauled taut, to confine the cap to the sternpost; the topsail is then united by bolts to spare spars to form the shape of the rudder, and then covered with any boards that may be in the ship; *c* are pieces of anchor stock, secured to the deck to form a collar for the topmast to work on; *d*, a rim secured round the topmast to keep it up in its place, working on the anchor stock *c*.

Commander Belcher's, is on a similar plan of construction to the foregoing, except that he joins his spare spars to the main topmast, by forming two hoops of iron, which encompass the spare spars and the mast. The parts of this rudder being put together in a dry state on being fitted, their immersion in water will cause the wood to swell and form itself into a compact mass, at once superseding the necessity of bolts; the difference of expense, by the spars not being destroyed by the bolts, is considerable in comparison with the Pakenham plan, in which nearly all the spars become useless from being weakened by having bolts driven through them. The expense for a Pakenham rudder in 1820, for a 74, was as under:

Spare main top-mast of a 74	£180	0	0
Jib boom	49	0	0
Main caps	2	12	0
Small spars, bolts, &c.	50	0	0
	281	12	0

So that the dead loss, or nearly so, by the use on any occasion, of Pakenham's rudder amounts to no less a sum than 281*l.* 12*s.* By Commander Belcher's plan, no bolts being used, the spars only being reduced, they may still be useful for a 50-gun ship, The plan was first proposed in 1820.

The loss of a rudder, and the difficulty in finding a substitute, says Mr. James Pearse, was experienced lately in the case of the Pique frigate, and as any means under such circumstances should be prompt and simple, he offers the following plan (fig. 2) to the notice of his brother seamen: —The power of an oar at the head or stern of a vessel, is as well known to the London bargemen as to the whaler, and this simple instrument he adopts; but as an oar of sufficient size cannot be conveniently used in a ship, substitute for it any spar as near one-third the length of the vessel as possible. On its outer end, are to be fastened as many boards at right angles in a conical shape as will contain a similar superficies to the rudder, and to the end of the spar attach guys. On the end inboard secure an eye, or ring bolt, that shall work freely (but not more loosely than can be helped,) on a chain, such as may be in the ship; use chain, because rope so soon rubs through. On the one end of the chain, have two stout hooks; in such emergencies all ships should have two eyebolts, one on each side of the sternpost, and a smaller one over the centre, so as to keep a small line rove, as conductor to the hooks and ensure their security whenever they may be required. Being thus prepared, nothing more is necessary than to reeve the chain through

Fig. 1.

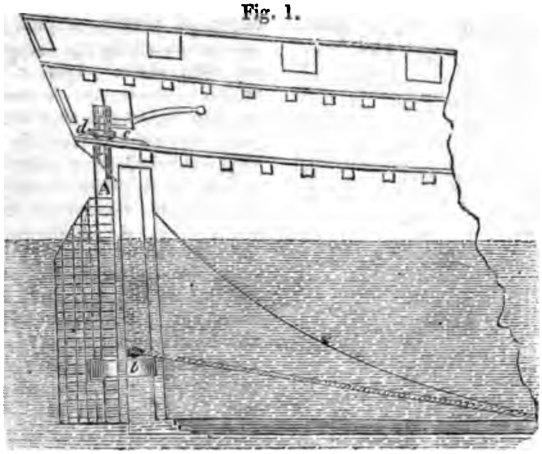


Fig. 2.

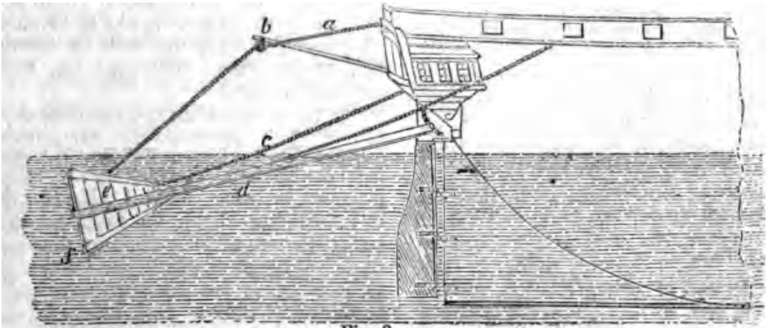


Fig. 3.

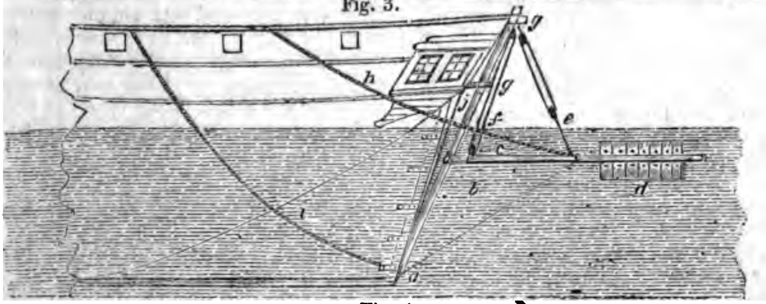
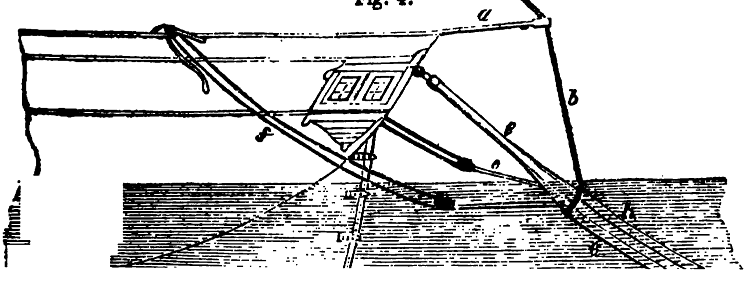


Fig. 4.



the inner ends, make fast a pig of ballast, or any weight, to the outer and lower end of the planks, for the purpose of sinking them three or four feet below the surface of the water, launch the spar overboard, bowse the chain or rope as tight as possible, the closer to the stern post the better; lead the guys to each quarter; if you have outriggers all the better, and if of the same length with your steering apparatus, and placed at an angle of 33° abaft the taffrail, it will increase the power nearly double, and steer the vessel as effectually as any rudder can do. Fig. 2 represents the stern of a vessel with the spar thirty-four feet long, and vanes, seventy-two feet superficial contents; the outrigger at an angle of 33°, the guys leading up the quarter to the wheel. *a a*, steering guys leading to the wheel; *b* outrigger and block; *c* water line; *d* steering lever or spar; *e* vanes; *f* pig of ballast to sink the outer end.

Fig. 3 is a drawing of Mr. John Cookesley's temporary rudder. A temporary stern post is made by securing a spar or spanker, or jib-boom up and down the stern; it must be well secured, and the partners accommodated to the rake of the spar, so that the lower end should come close to the stern post or damaged rudder. The temporary rudder is then to be formed of strong canvass, such as a storm fore stay-sail, with the haulyard part downward; this forms the back of the rudder; to the end of the spar is placed a series of oak planks, inch and a half thick, cut into lengths of two feet and a half, and let into the spar by sawing out the middle of it, as will be seen by reference to the sketch. Mr. Cookesley states that he has chosen materials of the lightest kind, as heavy ones used in forming temporary rudders require much time and trouble in preparing and fitting, especially if the ship is in much motion, which is generally the case; and the more bulky the materials are, the more violent is the effect of the sea, particularly in the pitching and ascending motions of the ship. Considering that the increased length of the levers from the centre of gravity of the ship, on this plan must always increase the power of the rudder, I have no doubt of its answering its intended purpose. In the figure, *a*, heel of the temporary stern post; *b*, canvass rudder; *c*, spar or trysail gaff; *d*, sweep of planks; *e*, peak haulyards; *f*, throat haulyards; *g g*, cleats, and partners securing stern post; *h*, wheel ropes secured to the gaff to steer by; *i*, guy secured to the keel or stern post; *j*, tack rope leading through the sheeve in the heel up through the rudder case.

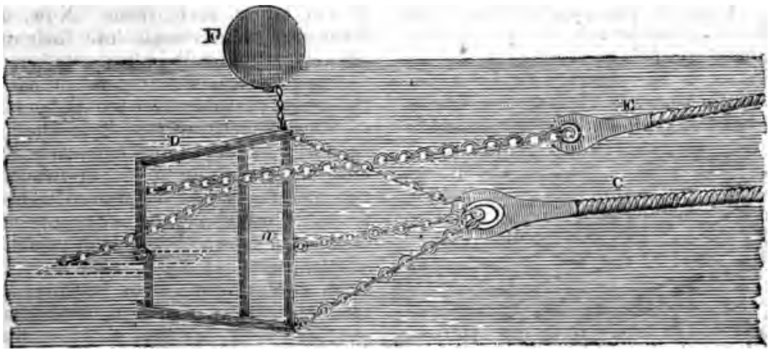
Fig. 4 represents a temporary rudder proposed by Mr. Pascoe, late of the Royal Navy; *a* is an iron outrigger, projecting over the stern; *b*, a topping lift passing over the roller in the outrigger, and leading to the gaff-end, or mizen topmast head; *c d*, guys with tackles; *f*, the falls leading inboard, to the wheel, after passing over outriggers *i*, on each quarter; *e*, a spar working in an eyebolt fixed in the stern, flattened at the outer end, and the resisting surfaces increased by two additional side pieces *h h*; *g a*, lower guy double at the stern post, passing forward and led in through the hawse holes, by which the lower end of the spar *e* is kept down.

The foregoing are a few only of the numerous plans that have been proposed, but are those which I consider the best. In addition to these, I have seen a model in the Adelaide Gallery, in which the inventor proposes to place, what I should call two swinging doors, on each quarter, under the line of floatation, by drawing up or letting go of which, the steering is to be effected; but these must be fitted to the vessel while in dock before taking in cargo; for it would be found impossible to heel a vessel sufficiently, while at sea, even in smooth water with any degree of safety, to fit them. Now, unfortunately when vessels lose their rudders, it is generally in bad weather, or through striking on a bank or bar at the mouth of some river or harbour, or on some like occasion. If, in the first case, it would be found extremely difficult and dangerous to fit any rudder; and with the best of the above described plans, it would be the work of some hours, during which the ship would be at the mercy of the waves; if in the latter case, no time is to be lost; and the best rudder, then, is that which can be fitted in the shortest time. The general plan that is resorted to in such cases of difficulty, at present, is the veering of a cable astern, or by lowering the boat with the plug out.

To provide for the "dangers of the sea" attendant upon the loss of the ship's

rudder, I was induced to try what effect two buckets would have on a vessel, from the circumstance of perceiving what immense resistance was offered to the drawing in of a bucket, which a boy, in a vessel I was in, had suffered inadvertently to run astern, while drawing water alongside. I afterwards tried several experiments in the steering of vessels by buckets, and found that the farther the buckets were veered astern, the greater became the resistance to their being drawn inboard; and a vessel going at the rate of eight or nine knots per hour, broke a rope one inch in diameter, before it had reached above three fathoms from the taffrail. It is obvious, therefore, that the steering of a vessel might be effected by means of common buckets. I shall now proceed to describe the plan I have matured for that purpose, which may be got ready in any ship in a few minutes, and steer the vessel with certainty and ease. Nothing is required but to fix one rope to the handle of the bucket, and let another be fastened to its bottom; if the bucket is then veered astern it will cause the ship's head to incline to which ever side of the ship the bucket has been thrown over; and when it is not wanted to exert any power, by hauling in the rope which is fastened to the bottom, it will be tilted on its side and offer comparatively no resistance to the water. Fig. 5 (front page), is a plan of the deck of a ship with the buckets in action, but in this plan the buckets are made in proportion to the size of the vessel, and of iron, not less than twice the diameter of the common ships' bucket. The situation for fixing them would depend principally upon the state of the weather; in light winds they would be found advantageously applied at the outer end of the lower studding sail booms, as shown in the figure, when they would act with great force, the booms forming levers. In high winds they may be applied by bending the lanyard from the buckets to the after part of the mizen channels. A A, two lower fore studding sail booms; B B B B, extra guy for securing studding sail booms; C C, lanyards leading to buckets D D; D D, buckets with valve bottoms opening outwards; E E, lines for closing the valves in ditto; F F, two blocks on the booms about half way out, through which the lines E E, for closing the valves (hereafter described) in the buckets pass, and which are led aft to the steering wheel. As common ships' buckets, besides being not strong enough, and consequently apt to be stove in, from their small size would have to be kept for a considerable distance astern to have proper effect upon the motion of the vessel, I propose that a pair of buckets, of iron, made in the following manner, be provided on board every ship. Fig. 6 is a section of the

Fig. 6.



buckets made as I propose; D, the bucket, made of sheet iron, to which is attached a copper, or iron buoy F, to keep it near the surface in light winds, and also to prevent its revolving should it have any tendency thereto; this bucket has a valve bottom, the axis of which is placed below the centre, so that it may

be opened by the water. C is a lanyard fastened to the bucket and carried up to the vessel; E, the line by which the valve is partially or wholly closed as may be required, for the guidance of the ship; the dotted lines show the valve open, and offering no resistance to the passage of the bucket through the water; G is an iron bar across the bucket, which serves as a stay, and has a hole in it, through which the piece of chain leads to the line E. It will be seen at once that if the lines E E are carried to the wheel, it may be worked by the man with as much ease as the common rudder; for the action of the wheel in closing one valve will at the same time give out the required quantity of line for opening the other. The cost of a couple of buckets on this construction could not exceed 5*l.*; therefore, the saving by adopting this plan, in lieu of the Pakenham, would be upwards of 276*l.* And when it is considered, that the loss of the rudder in bad weather would most likely cause serious damage to the vessel, if not her total loss by broaching to, none ought to go to sea without a contrivance so cheap and simple, especially as any smith could make them. They would be useful also for many common purposes, especially for discharging ballast, with a slight addition; the copper, or iron buoys could be made useful for small kedge or other anchors. Trusting that I have not infringed uselessly on your valuable time and space,

I remain, yours respectfully,

E. WHITLEY BAKER.

Old Broad Street.

PRESERVATION OF TIMBER BY SALT.

Sir,—The use of salt for the preservation of timber, as suggested by Dr. Granville, in his work on the Spas of Germany, and brought forward by Mr. Baddeley in your 738th Number, was tried as long ago as the year 1772, when the Princess Royal of 90 guns was pickled to preserve her from the dry rot, by a Mr. Jackson. It was found, however, not to answer; its effects being to make the ship damp, destroy the iron, and injure the health of the seamen. (See *Mechanics' Magazine*, No. 71, p. 234.)

There is little doubt but that salt would prevent the ravages of *dry* rot, but I fear *that it would produce* a not less destructive evil, *damp* rot. The affinity of salt for moisture is well known, and a little consideration will convince any one at all acquainted with the subject, that the evils above mentioned would be certain to result from its use.

Yours, &c.

Wapping, Oct. 6, 1837. OLD OAK.

COLONEL PASLEY'S EXPERIMENTS ON THE STRENGTH OF BRICK BEAMS.

In our last week's Number (p. 16) we inserted a paragraph taken from the papers of the day, stating that a series of experiments had been made by Colonel Pasley, of the Royal Engineers, (as well known for his liberality in all matters which tend to the advancement and encouragement of science, as for his attainments therein,) the object of which was, to ascertain whether cement could be used with safety in the brick walls of buildings, as a substitute for bond and chain timbers; and also to ascertain what additional strength is added to such a bond by the use of longitudinal hoop iron in the joints. The results of the experiments, were, however, stated in too general a manner to be of much utility. We have since been favoured with the following correct report of the results of these experiments, by a gentleman who was present on the occasion. The reader will refer to the paragraph in our last number (p. 16) for the description of the construction of each beam.

No. 1 beam was broken on the 27th at 2 P. M., with a weight of 298 lbs.; the break was not in the centre, but extended in two vertical seams, the one about 6 inches, the other 18 from the centre.

The strength was in favour of the cement, for in no direction did it give way; but on the other hand, the bricks were rent with an even fracture.

Another experiment was then made with the largest piece remaining, which measured about 4 feet over the piers: this required a weight of 2356 lbs., and the fracture was similar to the former.

No. 2 beam was tried on the next day, and was found capable of supporting 4723lbs., but gave way on the addition of 56lbs. ∴ 4723—498 (weight required without the longitudinal bonds) = 4225, the amount of strength gained by the use of iron bonds.

No. 3 gave way with a pressure of

between 400 and 500 lbs. There was nothing remarkable in this experiment.

The above experiments were necessarily imperfect, the power not being applied as it would be in practice; for it is evident, that with a wall of from 10 to 15, or even 20 feet of solid work, the pressure, instead of acting merely on the centre, would be diffused throughout the whole beam. Upon clearing away the bricks from the middle of No. 2 beam, the two lower bars were found drawn asunder, the middle one remained of the same length, and the upper pair found, what is called buckled, or folded on themselves, showing the neutral centre to be in the middle bar.

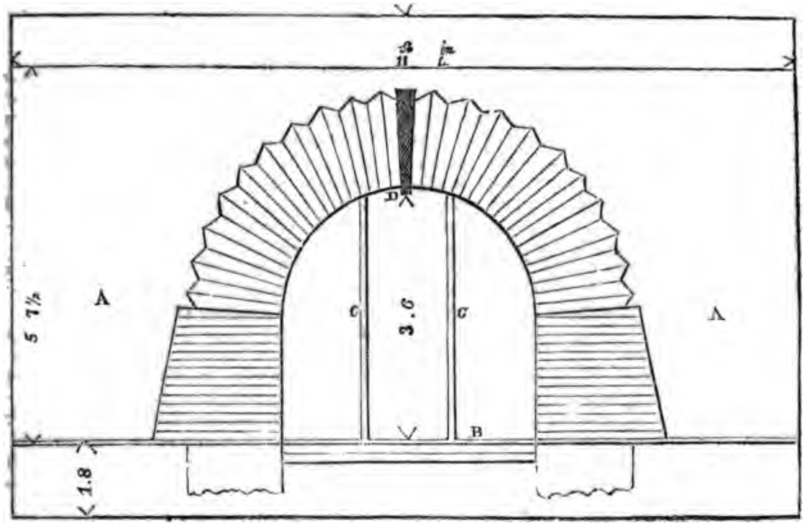
We may take this opportunity to observe, that the foundations of the new Judges Chambers in Chancery Lane, are being constructed after the manner of the beam No. 2, having a length of hoop iron to every row of bricks, and bedded in Roman cement.

ANCIENT ROMAN ARCHED VIADUCT.

Sir,—I inclose a sketch of the Roman viaduct lately discovered opposite Finsbury Chambers Circus, about seventeen feet below the surface of the pavement. It has been cleared out to the length of forty feet. At the extremity, there is a well where several pots, a coin, (Antoninus Pius) instruments and utensils have been found.

Fig. 1 is a section of the viaduct—A Kentish rag. B, two layers of large red tiles. C C two iron bars. D, keystone of the breadth of two of the common bricks.

Fig. 1.



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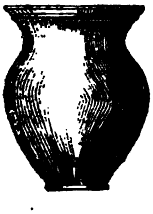

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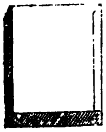

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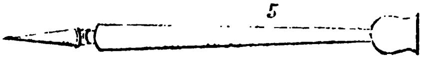

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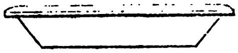

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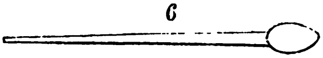

Fig. 2, one the common brick to scale 14 in. by 19 in. and 1¼ in. thick.

Fig. 3, one of the pots found in the viaduct, and Fig. 4, a saucer. Fig. 5, a stilus. Fig. 6 a black bone pin.

ANTIQUARIUS.

OYSTER SHELL MANURE.

Sir,—There was a time when *bones* were thrown away as being of no value; they are now collected, and make excellent manure. Would it not be worth the while of the bone collectors to offer a small sum, say a penny a bushel, for *oyster-shells?* I am persuaded that oyster-shells would make good manure, and a very small sum would furnish an inducement to the dealers in oysters to carry them to the parties who might think them worth collecting. The quantity of oysters consumed in London is immense, and the shells are, at present, a nuisance. Perhaps this hint may be turned to some account by those who constitute the body corporate of the oyster trade.

Yours respectfully.

CALX.

IMPROVEMENT IN GAS LIGHTING.

By an official report recently presented to the "Société d'Encouragement pour l'Industrie Nationale," it appears that a discovery hae been made by a French gentleman, M. Chaussenot, which, apart from its value as corroborating the hypothesis of Sir H. Davy and other philosophers with respect to incandescent bodies in a state of combustion, promises to be of considerable importance to the makers and consumers of gas for illuminative purposes. Davy was the first to announce that the solid particles of carbonaceous matter held suspended in flame are the principal cause of the production of light, the light being proportioned in degree to the temperature, more or less elevated of such particles, and to their aggregate number existing in an incandescent state. Rapid currents of cold air, whilst they render the flame more brilliant, whiter, and of less volume, have the defect of diminishing the quantity of light emitted, and a similar diminution of light takes place if the current of air be feeble, the flame being thereby rendered, though greater in volume, less brilliant, and of a brownish tinge. A series of delicate experiments subsequently elicited this law, that the maximum intensity of light takes place at the moment the solid particles of carbonaceous matter are just on the point of escaping combustion, and when, also, the admitted air approaches the strict limit of usefulness. But to obtain the strict maximum it was necessary that two important conditions should be united—namely, a more elevated temperature among the particles of carbonaceous matter, and a sufficiently large volume of flame. This remarkable result, after long baffling the attempt of experimentalists, has at length been accomplished by a contrivance of M. Chassenot, which was submitted to the society, and especially investigated by a committee appointed for that purpose. Like most important inventions, simplicity is its striking feature. It consists of a double envelope of glass, so contrived as to surround the flame, and to raise to a very high temperature the air, by which combustion is to be supported. Some idea may be formed of this contrivance, by supposing a common gas burner, with its glass chimney, encircled by an exterior cylinder of glass, the upper edge of which shall stand below that of the chimney by a distance of three or four inches, and the lower edge fitted into that of a metal cup screwed between the pillar and the burner. If the gas be now lighted in the usual manner, it is plain that the supply of air to the flame can only gain access to it by passing down the space between the two glasses (about three eights of an inch) and so upwards through the interior of the inner one; and as in its passage the heat of the flame elevates it to a very high temperature before it can arrive at the point where combustion is effected, the desired object becomes fully attained—namely, of feeding the flame with hot air instead of cold, and thus raising the light-giving particles of carbonaceous matter to the necessary degree of heat, for producing the maximum intensity of illuminative flame. By this simple means, merely, it has been found that a given amount of light is to be obtained at an expenditure of gas of nearly one-third less in quantity than what would be required to produce it by the best modifications of the old burners at present in use. The report of the French committee states the saving at 33 per cent.

A discovery of this importance, will no doubt lead to extensive alterations in the mode of using gas for artificial illumination, for, if by the adoption of the new contrivance (which in cost is represented to be very trifling) the gas companies will be enabled to supply a required quantity of light to their customers at nearly two-thirds the present price demanded, a very considerable saving will accrue to the consumer, and themselves be proportionably benefitted by the extended demand which the cheapness of the article will necessarily occasion.

PROCEEDINGS OF THE LIVERPOOL MEETING (BEING THE SEVENTH) OF THE BRITISH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

President—Earl of Burlington.

September 11—16, 1837.

(Select notices, extracted and abridged from the Athenæum).

(*Continued from* p. 14).

Dr. Clarke explained his method of facilitating the Calculation of Gases. The principle of his suggestion is illustrated by the following table, in which the atomic weights of different gases, the numbers being supposed to represent grains, are reduced, in the last column, to cubic inches :—

	Eq.	Cubic inches.
Oxygen	8	23.4
Hydrogen	1	46.8
Azote	14	46.8
Carbonic acid ..	22	46.8
Nitric oxide....	30	93.6

This plan he had, from experience, found to be admirably suited to the purposes of instruction, and, in particular, to obviate the difficulties invariably experienced by the chemical tyro in practically applying the doctrine of volumes.

A letter was read, addressed by Mr. Locke to Mr. W. Currie, in which the latter was requested to propose as a question, to the philosophers assembled, whether, in the case of a monument 140 feet in height, erected on the summit of a mountain 1400 feet high, augmented safety or danger would be the consequence of attaching to it a conductor or paratonnerre? The column is sandstone, the mountain conglomerate, and in the vicinity of the latter there is a mountain of still greater elevation—It was resolved, that this letter should be, *pro formâ*, put into the hands of Mr. Snow Harris, though no doubt whatever was felt as to the answer which it would be proper to give to such an inquiry. The efficacy of the protectors of Franklin in every possible situation, provided they be constructed upon proper principles, and mounted in a suitable manner, is now universally admitted.

The following letter addressed by Professor Hare, of Philadelphia, to the illustrious author of the Atomic Theory, was then brought before the Section :

"Philadelphia, Aug. 14th, 1837.

" Dear Sir—I beg leave, through you, to communicate to the British Association for the Advancement of Science, the fact, that, by an improvement in the method of constructing and supplying the hydro-oxygen blowpipe, originally contrived by me in the year 1801, I have succeeded in fusing, into a malleable mass, more than three-fourths of a pound of platina. In all, I fused more than two pounds fourteen ounces into four masses, averaging, of course, nearly the weight above mentioned. I see no difficulty in succeeding with much larger weights.

" The benefit resulting from this process is, in the facility which it affords of fusing scraps or old plantina wire, into lumps, from which it may be remodelled for new apparatus.

" The largest masses were fused agreeably to my original plan of keeping the gases in different receptacles, and allowing them to meet during efflux. I have, however, operated, in the large way, upon the plan contrived and employed by Newman, Brookes, Clarke, aud others, having employed as as much as thirty gallons, in one operation, of the mixture of the gaseous elements of water. This I was enabled to do with safety by an improvement in Hemming's safety tube. In this improved form, I have allowed the gas to explode as far into the tubes of efflux, as the point where the contrivance in question was interposed, at least a hundred times, without its extending beyond it.

" Still, however, the other mode in which gases are separate, untill they meet in passing out of their respective receptacles, is less pregnant with anxiety, if not with risk. As these elements are known to explode by the presence of several metals, other mysterious modes may be discovered.

" Having made a self regulating reservoir of chlorine, by suspending lump peroxide of manganese in concentrated chlorohydric acid, I was surprised that by a violent explosion, on presenting leaf metal to the jet tube. I had made similar apparatus before, and have repeated the process with the same materials since, without a repetition of the explosive reaction. It might be inferred, that the protoxide of chlorine was generated, but the colour of the gas was so inferior in intensity to that of chlorine, as to lead me to suppose, that there was some irregularity, before testing it with Dutch gold leaf. It has occurred to me, that there may be a dichloride of hydrogen which may explode with chiorine, and that of these the mixture consisted which produced the phenomenon in question.

" In freezing water by the vaporization of ether, the labour of pumping is lessened, and the pump protected from a disadvantageous introduction of the vapour, by interposing sulphuric acid. If the stern of a

funnel, with a cock, be luted in the tubulure of a retort, the beak of the latter into the neck of a receiver, of which the tubulure communicates with an air-pump, on placing water in the funnel, ether in the retort, and sulphuric acid in the receiver and exhausting; then allowing the water to descend into the ether, the congelation of the water is rapidly effected. Of course, the acid absorbs the etherial vapour with great force, and the resulting mixture, or rather combination, requires a temperate of at least 280° for its ebullition. This is less consistent with the doctrine of Mitscherlich than that of Hennell. It does not appear reconcileable with the idea, that the process of etherification is one of '*Catalysis*' or of the action of '*presence*.'

"I sent to Mr. E. M. Clarke a rotatory galvanometer which I have lately contrived.

"I need not say how much I regret that the Alantic rolls now between myself and those respected and esteemed brethren in science whom, this time last year, I had the honour and pleasure to meet and to greet at Bristol, and to whom I shall ever be grateful for their kind reception. How much would it gratify me, could I exhibit to them, and their enlightened visitors, that splendid concentration of heat and light which I have lately employed, by which a metal infusible in the air-furnace or forge is made as fluid as mercury, so as to be blown off in globules.

"With the highest esteem,
"I am, respectfully,
"Yours,
"DR. DALTON. "ROBERT HARE.

"P.S.—I beg leave to avail myself of this opportunity of stating, that the light used for the hydro-oxygen microscope, and produced by the hydro-oxygen flame with lime, was described in my original memoir, republished in the 14th vol. of Tilloch's *Philosophical Magazine*, where it is mentioned as being insupportable to the eye. This has been improperly since called *Drummond's* light. A premium has been since given to Mr. Maugham, for a modification of my blow-pipe, without the smallest reference to the inventor. It will be remembered, that I exhibited at the meeting of the Chemical Section last year, a blowpipe used by me for twenty years nearly, and of which an account was published, fifteen years since, in the Franklin Journal, which does not differ materially from that published as the contrivace of my friend Professor Daniell."

SECTION C.—GEOLOGY AND GEOGRAPHY. —THIRD SITTING.

Mr. Greenough exhibited a Geological Map of France, coloured by Messrs. Elie de Beaumont and Dufrénoy. Of this map only two copies have been finished; one for the French government, and the other had been sent over to be shown at the present meeting. The origin of this map was, the publication, several years ago of a Geological Map of England; at which time some French savans came to England to examine the plan of its execution. Mr. Greenough stated also, that in 1835, at the meeting of the German Association at Bonn, it was agreed that the scale of uniform colours should for future maps of all countries, be left to the selection of British geologists.

Mr. Sedgwick requested the attention of the Meeting to an account of the late unfortunate accident at the Workington Collieries. He pointed out on the geological map, the rocks which occur in that neighbourhood, and stated some of the phenomena of the stratification of the coal measures, which are there very much disturbed. There is an anticlinal line, on the opposite sides of which the strata dip differently, so that, in one place, very important beds of coal crop out under the sea. Workings quite submarine, have accordingly been carried on for some time: in the Isabella pit, a depth of 135 fathoms under high water has been reached. A culpable want of caution has been shown by the managers of late, as they have caused the workings to reach too near the sea—even within fourteen fathoms of it; and the pillars and roof of the older works had been taken away, by which the danger was greatly increased. There had been repeated warnings from the shrinking of the ground, and from an old work having become filled with water:—also in the new workings—although the pumping brought up 1000 gallons per minute, the miners were in such danger of being drowned, that several left the employment. In the latter end of July the sea at length broke in, filling the mine in all its parts in little more than two hours, and destroying twenty miles of railway. On one side of the Camperdown dyke, which ranges through the mine, not a soul was saved, but several escaped from other parts; and one individual, an Irishman, called Brennagh, had not only a remarkable escape himself, but saved three others by his intrepidity. Professor Sedgwick related to the Section this man's story, which was so singular, and told with such a mixture of the serious and ludicrous —often in the language of the man himself —that it is impossible to convey to the reader an idea of the effect produced on the audience. A remarkable fact in the escape of one of the individuals rescued by Brennagh was, that he was actually *blown up* the last open shaft of the mine by the enormous force of the air, the noise of which was heard at a considerable distance in the country.—

The first notice to Brennagh of the accident, was an unusual undulation of air in the galleries, which made him suspect all was not right, and he took the precaution of moving near to an air passage in the dyke, which he had been permitted to use: he was thus enabled so save himself and his companions. At the suggestion of the Professor, a subscription was made in the Section for Brennagh, which amounted to 34*l*.

Mr. Ham, of Bristol, communicated the result of his investigations on the mud of the Severn, into the embouchure of which river (he said) the tide flows higher, and with greater impetuosity,—consequently, repels more forcibly the current of fresh water,—than in any other river in the known world. The tidal wave changes the current of the tributary streams at the month of the Severn, and it is occasionally forced up the Wye to a height of sixty feet, and with a velocity of nearly nine miles in the hour. A consequent agitation of the water takes place in the embouchure, and in narrow channels the fresh water is actually driven back by the force of the tide. The mixture, however, is effected where the channel is wide and the bottom full of inequalities; and, in this case there is a constant regularity in the specific gravity at the same season of the year. Observations made in the month of August, from 1822 to the present year, making it 1020—water in the middle of the ocean being generally 1028.

There is manifestly a great evaporation in summer from so large a surface of water as that which forms this estuary; and Mr. Ham conceives the loss to be greater than is supplied by the tributary streams. He therefore supposes that the same identical water, or nearly so, is kept oscillating to and fro, by the force of the tide. On the Welsh coast, the water, being shallow, has a higher temperature (67° in August) than that on the opposite side (65°); and on the Welsh side Mr. Ham found the greatest quantity of mud. He ascertained, that at the mouth of the Avon the water contains 26.3 grains in every imperial gallon—in the deep channel 28.5—at the beginning of the shallows 35.0—on the opposite coast 72°—at the mouth of the Usk it was found to be 39.5—and the average of these five trials gave 4.03; so that, taking the channel area at 225 miles, the quantity of mud at the depth of one fathom, suspended in the water, would be 709,000 tons! If the quantity of homogeneous mud be the same at equal distances from the bottom, and with equal velocities in the current, it might be possible to prevent the formation of shoals, by so altering the channels that the *water may flow with an equal velocity in all their parts.*

SECTION D.—ZOOLOGY AND BOTANY.—THIRD SITTING.

The Rev. Jas. Yates read the 'Report of Dr. Daubeny on the cultivation of Plants under Glasses without Ventilation.'

In April last, the Doctor introduced into globular glass vessels, their aperture being covered with bladders, three several sets of plants. In the first were *Sedum*, *Lobelia*, &c.; in the second, *Primula*, *Alchemilla*, &c.: in the third, *Armeria*, *Sempervivum*, &c. At the end of ten days the plants were healthy, and had grown. The air in the jars was examined, when it was found that the first had 4 per cent. more oxygen than the atmosphere, the second also 4 per cent. more, and the third 1 per cent. more. This was the result of examination during the day, but at night the excess of oxygen had disappeared. On the eleventh day, the first jar contained 2 per cent., the second and third 1 per cent. excess of oxygen. At night there was less oxygen than in the atmosphere. On the 20th of June the following results were obtained: in first jar 2¼ per cent., in second jar 3½ per cent., and in third jar 4 per cent. less oxygen than in atmospheric air. Some experiments were then made to determine the rate of access of air to the plants through the bladder, and it was found that when the jars were filled with oxygen, the average rate at which it escaped till the internal air was like that of the atmosphere, was 11 per cent. daily.

Professor Lindley read a paper by Mr. Ward on the same subject. The Professor observed, that Mr. Ward. of Wellclose Square, London, had made many experiments on the subject of keeping plants in unventilated vessels, and was the original proposer of the plan for preserving plants in this manner. The discovery of their being able to be thus preserved, was of great practical importance, as it enabled us to bring plants from foreign climates, that could in no other way be introduced into this country. The paper commenced, "Consider the lilies *how* they grow." The attention of the author was first directed to this point by accident. He had placed under an inverted jar a chrysalis, and on looking at it some time after, he found a fern and a blade or two of grass had grown under the jar, the sides of which appeared to be covered with moisture. Taking the hint, he introduced some plants of Hymenophyllum under a jar, which grew and flourished in this situation. The Messrs. Loddige then enabled him to perform some experiments on a larger scale. The plants were enclosed in glass cases, or small green-houses, made tight with paint and putty, but, of course, not hermetically sealed, and were watered once in five or six weeks. From his experiments, the autho

came to the following conclusions:—First, that confining the air secured a more equable temperature for plants, as its expansion and contraction by change of external temperature, by its relation to heat in those states, prevented any great or sudden change. This was remarkably exemplified in some plants that were brought from India, which were in the course of three months successively exposed to 20°, 120°, and 40° of Fahrenheit. The enclosed plants were very frequently found surrounded by a temperature higher than the external atmosphere. Secondly, that vascular plants required to be grown in a greater quantity of air than cellular. Thirdly, that light must be freely admitted. Fourthly, that the enclosed air must be kept humid. This can be done by occasional watering, provided any means of escape for the water is allowed, but is not necessary where the water has no means of escape. Besides the advantage of enabling us to bring plants from abroad, it would also furnish to the physiological botanist the means of observing those operations of nature in his study, for which, before, he had been obliged to resort to the forest and the plain. As an instance, the author had been enabled to observe the rapid growth of a *Phallus fœtidus*, by merely devoting to it a few hours of the night. The writer concluded by suggesting that this mode of preserving tropical productions might be extended from the vegetable to the animal kingdom.

Professor Lindley also read a letter from the Messrs. Loddige to Mr. Ward, stating that in every case in which his instructions had been attended to, foreign plants had arrived in a state of safety.

The Rev. J. Yates read a paper on the same subject. Wishing, he observed, to make an experiment, on a large scale, which might be exhibited at the meeting of the British Association in Liverpool, a green-house, 9 feet by 18 in dimensions, and with a southern aspect, had been erected in the yard of the Mechanics' Institute, in Mount-street. It was stocked with foreign plants of all kinds, to the number of about 80 species. A list of the plants, and observations on their condition and progress, accompanied the report. The general result of the experiment was, that the plants had flourished perfectly well, being in a vigorous and healthy state, without any extraordinary growth. Many of them had flowered, and Canna and some Ferns had ripened seed. The green-house had no flue, and no provision for any artificial heat. It was judged best to construct it without a flue, for the purpose of trying, by a fair experiment, to what extent plants might in this state be kept alive, even during the severity of winter, which would certainly die if fresh air were more freely admitted. It was also to be observed, that nothing had been done to prevent the water from escaping through the yellow sandstone rock, on which the green-house was erected, and hence it had been necessary to give the plants occasionally a fresh supply of water. Mr. Yates further stated, that he had also grown plants under glass in London, where no plant could be made to flourish without such a protection. Nearly a year ago he planted *Lycopodium denticulatum* in a chemical preparation glass, with a ground stopper. During that time the bottle has never been opened; yet, the Lycopodium continues perfectly healthy, and has grown very much, although, for want of space, the form of the plant is distorted. Seeds which happened to be in the soil have germinated, and Marchantia has grown of itself within the glass. He also obtained a hollow glass globe of 18 inches diameter, and with an aperture sufficient to admit the hand for planting the specimens. A variety of Ferns and Lycopodiums were then set in the soil, which was properly moistened with water. This having been done, the aperture was covered with sheet India-rubber, its attachment to the glass being made perfectly air-tight. No change of air could take place, except by percolation through the India-rubber, which was every day forced either outwards, as the air within the glass was heated and expanded, or inwards in the reverse circumstance; these Ferns grew probably as well as they would have done in a green-house or hot house. They were all foreign, and some of them requiring a great heat. Several had ripened seed.

Mr. Gray stated, that he had grown Droseras under glass jars: one circumstance with regard to them he thought worthy of remark, their leaves did not turn red, as is usual when exposed to the atmosphere.

Professor Graham observed, that although in Mr. Ward's experiments atmospheric air had been admitted, he did not think it essential to the welfare of the plant. Plants grown in this manner only required a glass large enough to contain a sufficient quantity of air, to permit of the absorption of oxygen without deteriorating the air of the vessel to such an extent as to injure the plant. The want of red in the leaves of Drosera, he thought, depended on the presence of moisture. A singular point was, that plants growing naturally in arid soils and climates, flourished in the humid and confined atmosphere of the closed jars. He had placed under jars completely closed some plants of Cacti, which had flourished more than those not so situated. He did not think that ani-

mals could be sustained in the same manner as they consumed all the oxygen which they inspired.—Dr. Travers remarked, that he had seen common mould, which was a species of fungus, in a tube which had been heated and hermetically sealed for two years,—Mr. Bowman had observed at the Duke of Devonshire's, Chatsworth, that Droseras did not under the jars change the colour of their leaves as in open air. He wished to know of Dr. Graham, how long his Cacti had lived in a moist atmosphere; they were naturally at certain seasons of the year exposed to heavy rains. He thought it was very possible for plants and animals to live together.—Mr. Duncan inquired if plants were healthy and fit to be transplanted to the open air when treated in this manner.—Professor Graham stated, that the Cacti had lived without accession to air eighteen months. He believed that plants and animals might live together, provided the vessel in which they were inclosed was sufficiently large to enable the plants to absorb the carbonic acid gas expired by the animals. This would be a representation in miniature of what takes place in our own world.—Professor Lindley, in reply to Mr. Bowman's question, stated, that plants suffered little when confined in carefully closed vessels. From improper treatment they may become debilitated, but he had seen them arrive from foreign countries, when treated in this manner, in the most perfect state of health. Want of skill in the management of those brought from abroad was the most frequent cause of injury. Too much water was frequently given to plants when just packed. They had better be placed in too dry, than in too moist an atmosphere. He had seen this illustrated in plants from India; plants exposed to too much moisture rotted very soon. He thought the change of colour in the leaves of plants depended on their free exposure to light: the Droseras mentioned had not been exposed to the free access of light; this was certainly the case with the Droseras at Chatsworth and of Mr. Gray. The discovery of Mr. Ward was not only important in enabling us to import foreign plants, but it also rendered the ventilation of green-houses less necessary, and would enable gardeners to manage the artificial climate of their hot-houses with less difficulty. The fact that cellular plants grow best under this mode of treatment, was well established.—In answer to a question from Professor Lindley, Mr. Gray and Mr. Yates stated, that plants had both flowered and fruited under this plan of treatment.*—Professor Graham stated that the order in which he had found plants to grow best, was, 1. Lycopodiums; 2. Grasses; and 3. Begonias.

Mr. Pooley made some remarks on some swallows he had found embedded in ice in Germany. There were three of them in the ice; two were destroyed in extracting them, but a third recovered and lived some hours. From this fact he was led to bring forward the subject of the hybernation of birds.

Mr. Duncan observed, that this question had been lately discussed in a periodical publication. Physiologically it appeared impossible for an animal so high in the scale of creation as a swallow, to undergo the process of hybernation, and Dr. William Hunter had stated it to be impossible: yet, still there was an immense number of facts, that rendered the hybernation of higher animals a possible thing.—Mr. Selby said, that whatever might be thought of the occasional hybernation of these animals, he believed it could not be generally so, for these birds depart from our shores in a young state, and come back after having undergone the process of moulting, which could not take place if they hybernated.—Mr. Allis observed, that from the structure of the heart of the bird, it was impossible that it should remain motionless for a lengthened period without cessation of life. The swallow too was a bird with a heart larger than ordinary.—Professor Rymer Jones was inclined to consider the circumstance related as entirely accidental.

SECTION E.—ANATOMY AND MEDICINE.
THIRD SITTING.

The Secretary then read a paper by Dr. Madden, communicated by Professor Alison, being, "Experiments on the connexion between Nerves and Muscles." Two different opinions on the subject of his paper are entertained—the one by Dr. Whytt, and the school of neuralogists who attribute muscular motion to nerves and irritants, mechanical or chemical, which excite motions through nervous agency; and the other, that the power was inherent in the muscles themselves, the nerves being only conductors. Dr. Madden had been in consequence induced to institute a series of experiments which he detailed, and which he thought to bear out the conclusion that muscular contractility is *not* dependent on nervous influence.

Dr. Black read a report on the Epidemic Influenza, as it occurred at Bolton-le-Moors, in January, February, and March of this year.

From a register of the weather it appeared, that with the 14th day of January commenced a week of fair weather, but that

* At a green-house in Mount-street, we observed that *some Begonias and Malvas* were in full blossom, *and that several Ferns* and *Cannas* were in fruit.

after a very sudden rise, a declining state of the mercurial column took place, which reached its lowest depression of 28.88 on the evening of the 21st, whilst the dew point became nearer to the mean temperature. Contemporaneous with this lowest state of the atmospheric pressure, on the 21st commenced the full and rapid invasion of the epidemic, similar to some mighty mortific wave, that was sweeping over the country, sudden in its attack, but more lingering on its departure. As the disease advanced, the temperature fell for seven days, with continued rain, or snow till the end of the month. The barometer on the whole gradually rose, until it attained 30.10 on the morning of the 4th of February. The previous day the epidemic had reached its maximum intensity, having, in the course of a fortnight, laid the whole population, with trifling exceptions, under its influence, which extended from the merest *malaise*, or slight catarrah, to the most deadly effect on the functions and organs of life. After this culminating point, it gradually diminished in the number of cases, though not in the severity of many individual instances; and many diseases occurred, even until March, which could be fairly attributed to the constitutional taint or diathesis, which the epidemic had produced. The invasion of the epidemic was preceded by, and attended with, easterly and southerly winds, while the atmosphere was much loaded with moisture.

In comparing the *mortality* of the five previous years, during the same months with that during the prevalence of the epidemic, it appeared, that the increase on the whole three months was equal to 45 per cent. on the average mortality, and for the month of February alone, it was 160 per cent.

SECTION F.—STATISTICS.—SECOND SITTING.

The Report of the Committee appointed to investigate the state of education in the city of York was read. The population of the city, at the date of the inquiry, may be stated, in round numbers, at 28,000; of these

2290 or 7.96 per cent. attended Day or Evening Schools only.

2521 or 9.00 per cent. attended both Day and Sunday Schools.

842 or 3.01 per cent. attended Sunday Schools only.

Total School attendance 5591 or 19.97 per cent.

The Gentleman who drew up the Report, presented the following comparative Table of the Places examined by the Statistical Society of Manchester.

Per centage of the population who attend	200,000 Manchester.	50,000 Salford.	230,000 Liver. pool.	20,000 Bury.	28.000 York.
Dame Schools . . .	2.36	2.81	2.28	4.20	2.66
Comm. Day Schools .	3.40	3.30	2.65	4.04	1.96
Superior Private . .	1.47	1.60	1.77	0.87	2.56
Infant	0.32	0.68	0.96	1.42	1.48
Evening	0.73	0.96	0.24	0.75	0.15
Endowed and Charity	1.78	2.55	4.91	1.84	8.15
Total who attend Day-Schools	10.06	11.90	12.81	12.12	16.96
Sunday only . . .	11.59	11.53	1.62	15.51	3.01
Total who attend any Schools	21.65	23.43	14.43	28.63	19.97

Every successive inquiry demonstrates the extreme inaccuracy of the returns made to Government in 1833. Making full allowance for the schools established since that period, the net deficiency in the Government return in the districts examined by the Manchester Statistical Society, was 53 schools and 1650 scholars.

SAME SECTION.—THIRD SITTING.

A Report on the Condition of the *Working Classes in Manchester*, Salford, Bury, Ashton, Dukinfield, and Staly Bridge was read. The inquiries were made by a Committee appointed by the Statistical Society of Manchester. It occupied about seventeen months, in the years 1835-6, and cost the sum of 175*l*. The Committee's agents were almost uniformly well received; the only subjects, on which any disposition to mislead or resist inquiry was manifested, were those connected with the question of wages and the hours of labour. The report is extremely full and circumstantial, but the Committee regret their inability to draw any general conclusions, until

similar inquiries shall have been conducted in other parts of the country. Mr. R. Greg observed, that one of the best means of raising the moral character of the poor would be, to get them to improve their dwellings. Mr. Ashworth said, that this view was confirmed by experience in Bolton, where the improvement of the houses had led to an increase of delicacy of feeling and moral propriety.—Mr. Shuttleworth added, that, on the Duke of Norfolk's property, many of the operatives had become actual owners of their tenements, and that this had raised the character of the population, and improved the Duke's property.—Mr. Ashton stated he had only one turn-out of one week during thirty-seven years, which he attributed solely to the attention paid by himself and his partners to the domestic comforts and economy of his workmen.

A conversation followed on the possibility of having separate houses erected for the operatives; and it was generally agreed, that cottage comfort was one of the most beneficial objects to which public attention could be directed.

Mr. Slaney made a Report on the Wages of Labourers in Manufacturing Districts. The improvement in the condition of the higher and middle classes, during the last century, is manifest: the increase of carriages, from 1820 to 1833, was one-fourth, armorial bearings one-third, and male servants one-third. With respect to those articles which indicate the condition of the comforts of the middle classes, the consumption of tea had increased 24 per cent., of coffee 136 per cent.; stage coaches had doubled, and so had the consumption of textile fabrics. Taking the poor's rates as a test of the agricultural population, it was evident, that the condition of the peasantry had been greatly improved; and this view was further confirmed by the fact, that the deposits in saving banks had been greatly increased in the agricultural districts. The same test applied to the condition of the artificers, and shows progressive improvement; for the numbers of depositors, and amount of deposits in saving banks, had both increased one-third, while the increase of population was only one-eleventh. But, when we descend lower, to the class of unskilled artificers in large towns, we are led to conclude, that their condition has been deteriorated, from the decline of the deposits in savings banks, and from the decennial increase in crime, and the consumption of ardent spirits. The decennial increase of population in the five greatest of our manufacturing towns, averages 42 per cent., while the increase in the nation generally is only *11 per cent, and for London 20 per cent.*

Mr. Felkin read a Report on the Condition of the Manufacturing Classes in Nottingham, during the late period of commercial distress. The number of distressed applicants, from one of the highest-paid working classes in England,—the bobbin-net makers,—was as large as that from one of the lowest-paid classes, that is, the stocking-makers. The number of those who subscribed to sick clubs, &c. did not rise with the rate of wages. The provision itself offered by such clubs was partial and unsatisfactory—partial, because not meeting trade fluctuations at all, and unsatisfactory, because many sick clubs are ill-managed, and held at public-houses, while some are yearly proved to be insolvent. Finally, there was great improvidence in the class of artisans, which are generally highest in that which receives highest wages.

Mr. Felkin declared, that he was far from appearing as a calumniator of the operatives; he had sprung from them, and he lived by them; and he believed that he best proved his attachment to them, by showing the forms of improvidence which prevented them from advancing, as he had himself done, from the artisan's working-room to be a member of the British Association.

At the conclusion of Mr. Felkin's Report, several gentlemen declared, that the circulation of the paper among the operatives would have the most beneficial effects; and it was finally determined, that the publication should be immediate.

SECTION G.—MECHANICAL SCIENCE.
THIRD SITTING.

Mr. W. West made some observations on the Ventilation of Tunnels. He had found, from various experiments under different circumstances in the tunnel on the Leeds and Selby Railway, that, even when the external atmosphere is as near to perfect stillness as is common in this climate, an atmospheric current passes through the tunnel, with sufficient rapidity to prevent the loss from hot air, or gain from cold, of more than a very few degrees; and this takes place almost entirely at the entrance, while, without rapid transmission, it would, of course, soon reach the mean temperature of the spot. Sometimes, however, the thermometer shows that the air which enters at the windward end passes up the nearest shaft, leaving the remainder of the tunnel worse ventilated than if no shaft existed. As the results of his experiments, Mr. West submitted, first, that the legislature and the public need apprehend no danger from the stagnation of air in railway tunnels, while they have abundant protection, in the enor-

mous cost against any Company increasing, without occasion, their number or their length, Secondly, that it is at least doubtful whether open shafts do not rather impede, than promote, effectual ventilation from end to end.

(To be continued).

NOTES AND NOTICES.

Ford's Fire Escape.—During the week Mr. Ford, had the honour of exhibiting his ingenious fire-escape at the Castle. One of his machines was erected in the qudrangle, in the presence of several of the chief officers of the household, the Queen viewing it from the corridor. Her Majesty, the Duchess of Kent, and some of the Royal suite, we understand had before witnessed it. The machine (if so very simple a contrivance can be so called), is unquestionably superior to anything we have before witnessed. It has all the attributes which we conceive it possible to blend together for the purpose of saving life and property, and such seems to be the opinion of every person in Windsor who has witnessed it. Already, we understand, have Mr. Ford's machines been supplied to the Castle, where the experiments made with one, this week have been highly eulogised, especially by Sir Jefferey Wyatville. They are used for cleaning the windows, for which, as well as for their service in cases of fire, they are admirably adapted.—*Windsor and Eaton Express*, Sept. 16, 1837.

Avery's Rotary Steam Engine.—Mr. Ruthven, the agent for Avery's engines in Scotland, has now got one erected, and we saw it, says the *Scotsman*, in motion. The results of the experiment, are, however, not stated. The capabilities of this last but one of Jonathan's boasts—this Hero Redivivus, are now likely to have a fair trial. What we want to know, is the quantity of steam of a given pressure, required to generate a given quantity of disposeable power? This we have never been able to get clearly at from the American reports. We require well authenticated results of experiments, which may be compared with the acknowledged capabilities of the reciprocating engine.

The Artesian Well at Paris.—On the Place de Grenelle, near Paris, they have already bored to the depth of 1230 feet, in the hitherto vain attempt to form an Artesian Well. At this depth Reaumur's thermometer stands at 23 degrees (48 of Fahrenheit). According to M. Arago's calculation, water at a dept of 700 metres (2155 feet) ought to have temperature of 36 degrees of Reaumur, or 110 Fahrenheit.—*Times.*

Improvement in the Jacquard Loom.—A great improvement has just been effected in the jacquard loom, by which all the weights are dispensed with, and steam power is used to work the machinery. By this new machine silks of any pattern, of superior texture to the French, of the most even fabric, can be made by children or women. Springs are used to regulate the yard beam without reference to its diameter, and by a simple and ingenious contrivance, the yarn and cloth beams can be instantly stopped should the weight break.

Fire Proof Fabrics.—A French gentleman named Durais, has discovered a process by which linens, woollens, and even fine muslins, may be rendered fire proof. It appears that he exhibited the effects of his discovery to a number of scientific men, who witnessed gauses and muslins pass through a fierce fire without being in the slightest degree burnt or injured.

Robinson Crusoe's Island.—A paragraph has been lately going the round of the papers, to the effect that the Island of Juan Fernandez had disappeared from the face of the earth. A gentleman well acquainted with the west coast of South America, states that there is not the slightest truth in the statement, the island having been seen, as usual, by sea-faring men recently arrived from the Pacific. —*Times.*

Railroads in Germany.—The German enthusiasm for railroads, which seemed so strangely out of proportion with the commerce and resources of the country, has now, it appears, declined from feverheat to something a little below temperate. The cause of this is attributed to the discovery lately announced by the management of the projected line from Leipzic to Dresden, perhaps the very one in all Germany most likely to pay, that the expense of the undertaking,which had been originally estimated at a million and a half of dollars, would, according to present calculations, amount to four millions and a half, or three times the original estimate. Confidence has thus been thoroughly, perhaps irrecoverably shaken; and, as usual, those undertakings, in which the calculations were made with more care and circumspection, have been confounded by the undiscriminating eye of the public with the very worst of their brethren.

German Scientific Association.—Soon after the meeting of the British Association at Liverpool, its German prototype, the Society of "Enquirers into Nature" (Naturforscher) held its fifteenth annual assembly at Prague. The object which seems to have attracted most attention this year, was an apparatus for the production of powerful electric streams by means of steel magnets operating on a multiplying conductor. It was exhibited and explained by its inventor, M. Von Ettingshausen, Professor of Physic at the High School of Vienna. This gentleman acknowledged that his apparatus bore some resemblance in principle to that invented for the same purpose by Mr. Clarke of London, and that it was by no means superior in power, but contended that his apparatus was the more simple and convenient of the two. None of the other communications to the Association appear to have been of particular interest; yet judging by one instance, novelty is not considered an indispensable requisite. Court Councillor, Tilesius, we are told, exhibited representations of some of the animals collected by him in his voyage round the world with Krusenstern, whom he was appointed by the Russian government to accompany as naturalist to the expedition—an expedition, which it will be remembered, took place about a third of a century ago, extending from 1803 to 1806. Like our own Association, the Society of "Enquiries into Nature" appears to be popular among country towns in want of excitement. It received no less than three invitations from the authorities of towns desirous of being its place of meeting next year. On its being put to the vote, Erlangen and Rostock were passed over, and Freiburg, in Baden, selected, chiefly, it is said, to afford an opportunity to Professor Oken, the original suggester of the idea, and founder of the institution, to be present at the operations of his own new apparatus for the production of electric streams of science, from which he has been for ten years an unwilling absentee.

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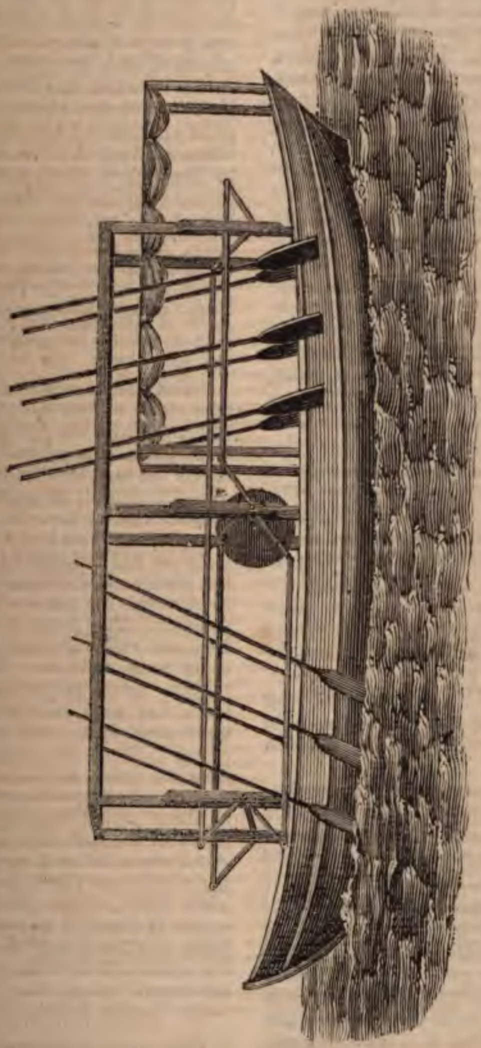


JOHN FITCH'S STEAM BOAT, 1788.

EARLY EXPERIMENTS IN STEAM NAVIGATION. JOHN FITCH'S STEAM-BOAT.

A division of society, into the few sanguine and enthusiastic experimenters, and the many cool and incredulous lookers on, has existed at one time or other in regard to every great object which has been effected by the powers of man. The effect of this division is rather beneficial to the cause of science than the contrary; the sanguine man, acting as a spur upon the more cautious, urging him onward, and the cool, as a check upon the enthusiastic, preventing him from rushing headlong into absurdity.

The steam engine passed through this ordeal; but even after it had taken firm root on land, its utility on shipboard for the navigation of vessels on rivers and on the ocean, was as much a matter of incredulity as was the very first application of the power. Amongst the enthusiastic few who bore the burthen and heat of the day, who struggled in penury, and amidst the world's derision, having nothing but their own high hopes to sustain them, and the fruits of whose exertions we are now reaping, was John Fitch of Philadelphia: his claims as a nearly cotemporaneous inventor with Symington, of a means of propelling vessels by steam, we now propose to lay before the mechanical public. The present time is one most appropriate for this purpose, as we believe the world to be (spite of the auguries of Dr. Lardner) on the eve of the fulfilment of a remarkable prophecy of Fitch's—"This, Sir," said he to one of his patrons, referring to his experimental steam-boat, "will be the mode of crossing the Atlantic, in time."

The invention of steam navigation has become a national question,—and the honor of its birth is claimed by various countries. Arago has lately put in a claim on behalf of his countryman, Papin, on the ground of his having suggested the *possibility* of its being effected. Spain has put forward her claim for Blascoc de Garay, who is affirmed to have put the project in execution as early as 1543; the evidence is however so vague, as to be altogether unworthy of credit. But of all the claimants, brother Jonathan is the most clamorous and pertinacious, and that too, in behalf *of one whom it has been proved beyond dispute was a mere copyist*. Fulton, it is well known, built his first steam-boat from drawings and descriptions obtained from Symington. Had the Americans been as urgent on behalf of John Fitch, there would have been both justice and reason in the claim. Fitch, it appears certain, was no plagiarist; he was an inventor of the pure and enthusiastic kind; and although Symington had the priority in point of the time of experiment, it is evident that the idea was, as nearly as possible, cotemporaneous in the minds of both inventors.

Our attention was first drawn to Fitch's invention of steam navigation, by a pamphlet entitled "Additions to the Articles 'Steam Engine,' 'Steam Boat,' &c., in Brewster's Enclyclodedia Edinburghensis, by James Mease, M.D., Member of the American Philosophical Society," &c., which contains the following extract from the Colombian (Philadelphia) Magazine, vol. 1, for December 1786, in which Fitch describes to the public the plan on which his projected steam-boat was to be built.

"The cylinder is to be horizontal, and the steam to work with equal force at each end. The mode by which we obtain what I term a vacuum is, it is believed, entirely new, as is also the method of letting the water into it, and throwing it off against the atmosphere without any friction. It is expected that the cylinder, which is of 12 inches diameter, will move a clear force of 11 or 12 cwt. after the frictions are deducted; this force is to be directed against a wheel of 18 inches diameter. The piston is to move about 3 feet, and each vibration of it gives the axis about forty evolutions. Each evolution of the axis moves twelve oars or paddles 5½ feet; they work perpendicularly, and are represented by the strokes of a paddle of a canoe. As six of the paddles are raised from the water, six more are entered, and the two sets of paddles make their strokes of about 11 feet in each evolution. The crank of the axis acts upon the paddles, about one third of their length from their lower ends, on which part of the oar the whole force of the axis is applied. The engine is placed in the bottom of the boat, about one third from the stern, and both the action and reaction turn the wheel the same way."

Dr. Mease then proceeds—

Fitch gives a particular account of the progress of his operations in steam, from the first time that the thought occurred to him of using it, to the completion of the boat, so far as to make numerous experi-

ments on the Delaware; of the subsequent alterations made in the engine, and of the final abandonment of the scheme by the original subscribers. This account shews him to have been a strong-minded, but unlettered, man, with a perseverance almost unexampled, and a determination to let no difficulty in the execution of his plan prevent him from endeavouring to bring it to perfection, so long as the share-holders furnished the means of defraying the experiments; but they refused to advance more funds. This they did after interfering with his views, and attempting expensive plans of improvement, which failed of success. The conviction of Fitch, however, respecting the power of steam, continued firm; and in June, 1792, when the boat was laid up, he addressed a letter to Mr. Rittenhouse, one of the share-holders, on the subject, in which he says, "it would be much easier to carry a first-rate man-of-war by steam than a boat, as we would not be cramped for room, nor would the weight of machinery be felt. *This, Sir, will be the mode of crossing the Atlantic, in time*, whether I bring it to perfection or not, for packets and armed vessels. I mean to make use of wind when we have it, and in calms to pursue the voyage at the rate of seven or eight miles an hour." He further suggests the use of steam to conquer the cruisers of Barbary, by which several American vessels had been taken about that time. He says, "a 6-foot cylinder could discharge a column of water from the round top 40 or 50 yards, and throw a man off his feet, and wet their arms and ammunition." He complains of his poverty, and to raise funds, he urges Mr. Rittenhouse to buy his land in Kentucky, that he "might have the honour of enabling him to complete the great undertaking." His enthusiasm on the subject never diminished one moment, and steam was the constant theme of his discourse, whenever he could prevail upon any one to listen to him. Upon one occasion, he called upon a smith who had worked upon his boat, and after dwelling for some time upon his favourite topic, concluded with these words: "Well, gentlemen, although I shall not live to see the time, you will, when steam-boats will be preferred to all other means of conveyance, and especially for passengers, and they will be particularly useful in the navigation of the river Mississippi." He then retired, when a person present observed, in a tone of deep sympathy, "Poor fellow, what a pity he is crazy!" The predictions of the benefits which this country would one day derive from steam navigation, are made in several places in the course of his manuscripts left to the library company. The distress of mind, and mortification he suffered, from the failure of his protracted exertions, and his poverty, were too much for him, and to drown his reflections, he had recourse to the common, but deceptive remedy, strong drink, in which he indulged to excess, and retiring to Pittsburgh, he ended his days by plunging into the Alleghany.

Without stopping to moralize upon this melancholy instance of the fate of a man unable to lower his intellect to the mediocrity of his fellow-men, we shall proceed with our statement of his claims. Dr. Mease refers us to the *Monthly Magazine* for October, 1815. We have turned to this, and at p. 199, we find, "A short Account of the origin of Steam Boats, by Dr. Thornton, Director of the Patent Office, Washington." In this memoir, Fulton's claim is completely set aside, and we hope that now we again give publicity to the refutation, Brother Jonathan will not have the pertinacious hardihood to reassert it.

"Finding," says Dr. Thornton, "that Mr. Robert Fulton, whose genius and talents I highly respect, has been by some considered as the inventor of the steam boat, I think it a duty to the memory of the late John Fitch to set forth with as much brevity as possible, the fallacy of this opinion, and to show, moreover, that if Mr. Fulton has any claim whatever, it must be exceedingly limited.

"In the year 1788, the late John Fitch applied for, and obtained a patent for the application of steam to navigation, in the states of Pennsylvania, New York, New Jersey, Delaware, &c.; and soon after, Mr. James Rumsey, conceiving he had made some discoveries in perfecting the same, applied to the State of Pennsylvania for a patent. But a company, formed by John Fitch, under his state patents, of which the author of this (Dr. Thornton) was one of the principal shareholders, conceiving that the patent of Fitch was not for any peculiar mode of applying the steam to navigation," opposed the application of Rumsey and his party; and the decision of the legislature being in favour of Fitch, "Rumsey's company were excluded from the right of using steam boats on any principle."

Dr. Thornton goes on to say, "we worked incessantly at the boat to bring it to perfection, and some account of

our labours may be seen in the Travels of Brissot de Warville in this country; and under the disadvantages of never having seen a steam-engine on the principles contemplated, of not having a single engineer in our company, or pay, (we made engineers of common blacksmiths); and after expending many thousand dollars, the boat did not exceed three miles an hour."

Many of the shareholders in Fitch's company were unwilling to proceed; but Dr. Thornton, and a few others, undertook to make her go at the rate of eight miles an hour, within eighteen months, "or forfeit all the expenditure on failing." These terms being agreed to, a second experiment was made. "I (says Dr. Thornton) was among the number who proceeded, and in less than twelve months we were ready for the experiment; a mile was measured in Front-street (or Water-street), Philadelphia;" every precaution was taken before witnesses, the time was shewn to all, the experiment declared to be fairly made, and the boat was found to go at the rate of eight miles an hour, or one mile within the eighth of an hour. It afterwards went eighty miles in one day. Governor Mifflin, attended by the Council of Pennsylvania, came in procession, and placed in the boat a superb silk flag, prepared expressly for the purpose, and containing the arms of Pennsylvania."

Fitch went to France by invitation of the government, to construct some steam boats for them, and took this flag with him, and presented it to the National Convention: not finding engineers, however, who could execute his plans, and other circumstances arising, he returned to America at the cost of Mr. Vael, the consul at L'Orient.

This is the substance of Dr. Thornton's narrative; and from these authorities, it appears that Fitch *commenced* his operations in 1788, the same year in which Symington had *finished* his first steam boat, and tried it upon the lake at Dalswinton. It is altogether improbable that either party knew anything of the proceedings of the other; and we infer so, as much from the apparently bold and original character of Fitch, as from the evidence of dates. Whilst, therefore, we still claim for our own country and Symington, the honour of the *first* invention of steam navigation, we are in justice bound to concede to America and Fitch, the merit of inventing it a *second* time, unaided by any knowledge of what had been previously done, believing, as we honestly do, the one invention to be as original as the other.

ANSWER TO THE QUESTION PROPOSED BY "A CAMBRIDGE STUDENT." VOL. 27, P. 366.

Question. "At what distance from the sun must a superior planet be placed, so that its synodic revolution may be n mean solar days, and determine the limits of possibility?"

The synodic period of any *superior* planet must be greater than the earth's siderial period, consequently, the least number of complete days, in which a conjunction of the sun and planet can take place as seen from the earth, will be when $n=366$.

Let D denote the distance of the earth from the sun, d that of the planet; P the earth's siderial period, p that of the planet; and n=synodic period in days. Whence, taking the earth's siderial period at 365.¼ days; we have $\frac{\text{P}}{n-\text{P}} = 487$ synodic periods of the planet, which are completed in 488 years, or siderial periods of the earth; hence $p=178242$ days, which constitute the siderial period of the assumed planet.

Consequently, $\text{P}^2 : \text{D}^3 : : p^2 : d^3$; or $d = 61.984$, the distance of the planet from the sun; that of the earth being unity, or nearly 3¼ times the distance of Uranus, or the Georgian planet. In finding the limit of possibility at its nearest distance, the diameter of the planet ought to have been given; now that of the earth is nearly 8000 miles, and if we suppose it to be of equal magnitude, we may estimate its distance from the sun at 95,010,000 miles, that of the earth being 95 millions. Hence, $\text{D}^3 : \text{P}^2 : : d^3 : p^2$; or $p=365.30758316$ days. Whence, $\frac{\text{P}p}{p-\text{P}}=n=2317146$ solar days $=6343$ siderial periods of the planet, or 6344 siderial periods of the earth; as the planet will complete 6343, and the earth 6344 siderial revolutions before the earth (or sun) overtakes the planet. This latter period is just thirteen times longer than the siderial period of the planet in the first case, as $\frac{6344}{488} = 13$

The limits of possibility are therefore any number of complete days from 366 up to 2,317,146. Or consists of 2316781 synodic years, the difference between each consecutive year being one complete solar day.

J. UTTING.

Lynn, Oct. 1837.

MR. UTTING'S ASTRONOMICAL TABLES. TO A SCOTCH DOMINIE.

Sir.—Since addressing you on the 6th ult., I have received part 176 of the *Mechanics' Magazine,* in which is inserted a letter from you containing further remarks on my period of conjunction (vide p. 365), where you assert, that "Mr. Utting would fain wriggle himself out of the blunders he has fallen into in respect to his method of determining the synodic periods of any of the planets." There is, however, but little in that letter worthy of observation, excepting a series of formulæ introduced in order to prove the above "blunders" I have "fallen into." Now, really, Mr. Dominie, you are completely running a tilt; as I have not given any formulæ for finding the synodic periods, but have merely given a corrected application of those used by yourself, in order to convict you of the blunders which you have falsely attributed to me. In respect to my Tables (vol. 26., p. 378), synodic periods are entirely out of the question, as my Tables have no reference to them. If, however, the synodic periods are required from the data given in my Tables, that relative to moon (vol. 27, p. 31), will be found perfectly correct, and much easier than by the formula you have employed, which, by the bye, although you have made a display of, you are ignorant both of their theory and application; as at page 366, you say, "that according to my principles $S = \frac{T\,T'}{T-T'}$. But this you positively deny," notwithstanding my periods are solar or *tropical* periods, and T, T' are according to your own showing *tropical* periods also! And further, you assert, that in no case in the solar system is $\frac{T\,T'}{T-T'} = \frac{P\,P'}{P-P'}$. What a display of intelligence! Who ever contested such a point? Verily, friend Dominie, every tyro in astronomy does indeed *know, that siderial are not tropical periods, and of course* similar results cannot obtain from both. Now, $\frac{P\,P'}{P-P'}$ is equal to the synodic period in respect to the fixed stars; or, if I may so express it, the *siderial*-synodic period; and $\frac{T\,T'}{T-T'}$ is the synodic period in reference to the equinox, or the *tropical*-synodic period; the latter only of which is applicable to my Tables, notwithstanding your positive assertions to the contrary. It is now, I think, high time I should take my leave of you, and shall therefore conclude, by observing, that the readers of the *Mechanics' Magazine* are quite able to judge for themselves, as to which of us, has got the most "blunders" to "wriggle out of!"

Trusting that your intended "jaunt to Rob Roy's country" will improve your intellectual faculties, I remain, Sir,

Yours, &c.

J. UTTING.

Lynn Regis, Oct. 6, 1837.

QUESTIONS IN HOROLOGY.

I observe by my clock that the hour hand is between the hours of nine and ten, and that the hour and minute hands are in opposition. Determine the time; also when the hands are at right angles with each other, and when next in conjunction.

Admit the hour, minute, and second hands of a clock to revolve about the same axis. Determine the possibility of the dial-plate being trisected; and also the time at the instant of trisection, supposing the hands to be in conjunction at twelve o'clock.—HOMO.

FRENCH METHOD OF NOTATION.

Sir,—In your valuable Magazine (No. 737, p. 416) Mr. Utting expresses his opinion that, the French method of notation being applied to angular measurements, would be much more convenient than the system now in use. I beg permission to be of the same opinion, on that subject, and to show the possibility of its adoption.

Let the table stand thus:—

10 furlongs one mile.
100 yards one furlong.
100 inches one yard.
10 inches one foot.
10 feet one yard.

The inches, feet, yards, &c., must be different to those now in use, whatever system is adopted to *amend* the present method; perhaps the following may be found as convenient as any, and cause less derangement to tables and instruments than any other.

Let the mile be two thousand (of the present) yards long; the yard be 6 feet, or 72 inches long (by the present measurement), and then the inch will be $\frac{72}{100}$ of the present inch, which will be as readily divided into tenths as the present one is divided into sixteenths. The furlong would be 200 (of the present) yards long, or 100 yards by the plan I propose, the mile being one thousand yards, of 6 feet each; the new yard would be equal to 10 feet of 7 $\frac{2}{10}$ (of the present) inches long; and would be as convenient to divide into 10 as the present into 3 feet; for, being *exactly* twice the length of the present yard, the difficulty would soon be overcome.

The diameter of a circle being 6 yards, its circumference would be 18 yards 6 feet, or 18 yards 60 inches, (noted thus, 18° 6′, or by feet 186′; by inches thus, 1860″, or 18° 60″); by the method I propose, or, by the present system 18 yards 21.6 inches.

Sir, if you think the above may possibly have a tendency to promote the adoption of a plan of undoubted utility in scientific calculation, its early insertion will oblige,

Your very obedient servant,

T. SIMPSON.

Sheffield, Oct. 7, 1837,

PARATHUNDERS *versus* PARATONNERRES.

Sir,—In your last number in the account of the proceedings of the Liverpoll Meeting of the British Association, it is stated that a letter was read addressed by Mr. Locke, to Mr. W. Currie, inquiring, whether, in a certain case, augmented safety or danger would be the result of attaching to a building "a conductor or *paratonnerre*."

Had there been a "language class" of the Association, it would certainly have been its duty on this occasion to vindicate the rights of our native tongue, and point out the absurdity of making use of a foreign coinage, when the King's, —*or now I suppose, the* Queen's English would serve the purpose equally well. That class of words to which *paratonnerre* belongs, seems to have a strange parasitical power of taking hold of English fancies. Within the course of the last thirty or forty years, several compounds of the same nature have been imported, yet nothing could be easier than to supply their place with articles of British manufacture.

The Italians have a word "*parare*," which among other meanings signifies "to ward off, to *parry*," the latter verb in English having been apparently taken from it, as indeed most of the technical terms of fencing are derived from the Italian. With this and the word *sole*, sun, they formed the compound *parasole*, or parry-sun, in a manner common in Italian, and imitated in our own language in the words pick-pocket, cut-throat and others. The French adopt the term, merely cutting off the final *e*, and thus acquired a word without any meaning, but an arbitrary one;—since to convey the same signification in French as parasole does in Italian, they ought to say not parasol, but *pare-soleil*. Perceiving this they took care to avoid the same defect in their future compounds of the same nature, and merely retaining the Italian *para* as more harmonious than their own *pare* they formed from *pluie*, rain, the term *parapluie*, an umbrella; from *chute*, fall *parachute*; from *tonnerre*, thunder, *paratonnerre*, and so on. Whenever a term of this description is now wanted, it is invariably formed by prefixing the syllables "para" to whatever is to be guarded against, and the meaning is conveyed at once. In following their steps the English have somehow fallen into the awkward blunder of borrowing not the general principle, but the individual adaptation of it, and thus loading their dictionaries and their memories with a quantity of useless lumber. A few years ago an Italian invented a method of protecting the crops from hail-storms; an account of the discovery appeared in several English journals, and those who took their information from an Italian source, called the invention a *paragrandine*; those who derived it from a French one, a *paragrêle*; but not one of them thought of calling it a *parahail*. It must be owned that this course of proceeding implies a degree of clumsy stupidity in the perpetrators, not pleasing to contem-

plate. For the future, let us hope that a little more sharpness of perception will be evinced by those who introduce new terms into the vocabulary of science. The words *parasol* and *parachute*, the latter of which is used by Wordsworth in one of his poems, have, perhaps, by prescription, acquired a right to remain where they are; but *parathunder* ought completely to supersede *paratonnerre*. *Parafeu* should be compelled to yield to *parafire*;—and then, and not till then, will it be thought that our scientific men have acquired a sufficient knowledge of language to serve as a *para-gibberish*.

It may indeed be alleged, that there is no need of having even half of the word foreign; that we might say, "parry-thunder," or following the German fashion (as exemplified in *sonnenschirm*, sun-screen, for parasol, and *regenschirm*, rain-screen, for umbrella), adopt the expression "thunder-screen." This might perhaps be more pleasing to purists, but the harmony of the word *para* is a recommendation; compounds formed of it would be more likely to come into use, and when once the public were familiar with a few instances of the manner of employing it, it would convey its own meaning as readily as could be wished. The use of the prefix *ex* is a case in point. The expressions ex-king, ex-sheriff, &c. are comprehended as readily as if *ex* were the most unexceptionable Anglo-Saxon. To object to all foreign words is to propose a useless and impracticable refinement. The Germans have endeavoured to exclude from their language all expressions not thoroughly German, but even they have not succeeded. They call geology *erdenkunde*, but not being able to form an adjective from the word, they are still compelled to say "*geologisch*" for "geological," and thus no advantage is gained. Were we to call that science "earthknowledge" we should be equally perplexed to form an adjective from it, but were we to name it "earthology" we might draw from that new compound all the necessary terms, and every one would at once understand them.

I am afraid I have trespassed too much upon your patience with these word—*ological* discussions, but I am persuaded they may be useful to some of the ingenious readers of the *Mechanics' Magazine*. Our neighbours in France in naming their inventions, very often find occasion to form a word with a *para* at the beginning; the practice has not as yet found its way into England; but when the principle of the thing is once known, it may help many a mechanician to give a better and a briefer name to some of his contrivances than he would otherwise be able to do. The nomenclature of mechanics is a subject that has hitherto been neglected, although so much attention has been paid to the reform of the nomenclature of chemistry. Were some ingenious man to apply himself to contrive a scheme for its improvement, it appears not improbable that a way might be pointed out of so naming every machine as briefly to indicate its purpose, its materials, and the more important features of its construction, thus effecting for mechanics in some measure, what Linnæus effected for botany.

I remain, Sir, yours, &c.

P. P. C. R.

October 18, 1837.

THE RIVAL FIRE ESCAPES.

Sir,—In your Magazine of Saturday last (the 7th instant), I see a letter written by Mr. Baddeley, calculaled to injure the cause of an institution established for the humane purpose of rescuing the lives of our fellow creatures from fire; also endeavouring to set the public against a very ingenious machine invented to assist in carrying that object into effect. Mr. Wivell, the inventor of the "Paragon," and Mr. Baddeley, the champion of Messrs. Ford and Merryweather, are at issue as regards the efficiency of various inventions. Mr. W. challenges his opponent to a competition, that the public may decide the issue. Mr. B.'s answer is, that he has no power to order a public exhibition of the Society's escapes, and that one has already taken place at the Charing Cross Barracks, that Mr. Wivell's "Paragon" was called, but did not come, being afraid of "the deep area, lofty iron railing, and high windows of the ugly building of the barracks." The fact is, that the "Paragon," at that time did not belong to the Society, and Mr. Wivell, to his great mortification, was not called by them. The Marquis Cholmondeley, their patron, hearing of Mr. Wivell's invention, naturally asked why it was not there? he received for an-

swer it was only an exhibition of the *Society's escapes*; and it did not belong to them. Another proof, "that public opinion is against Mr. Wivell's invention is" (says Mr. B.) "that Ford's spar escape has been adopted and purchased by several London parishes, at Liverpôol, by the Commissioners of Woods and Forests for the palaces, the St. Pancras Fire Association, and the Society for the Protection of Life from Fire." The three first were supplied through private interference; the St. Pancras Association, before Mr. Wivell's "Paragon" was in existence, and the latter society has adopted it; which clearly shows Mr. Wivell has had no chance of competing, except when Mr. Ford *privately* exhibited in the workhouse yard, Poland-street, Mr. Wivell did, *publicly* in that neighbourhood, and who can boldly come forth and say public opinion was not then with Mr. Wivell? If Messrs. Ford and Merryweather are half so sanguine of superiority as Mr. Baddeley appears to be, I think by his expressing a wish for them so to do, they will not hesitate, but except the challenge. Mr. B. also alludes to that lamentable fire in the Strand, "in the immediate vicinity of one of the Society's escapes," and "yet, from a series of the most unaccountable blunders three individuals perished in the flames." The escape he alludes to was "Ford's spar escape," and was from the *ignorance* of the parties using it (*although so efficient*), placed the wrong end upwards, thereby rendering it useless.

As regards the correspondence between Mr. B. and the Secretary of the Humane Society, the short and proper answer to the question will convince the public that the society will not interfere with the disputes of individuals, but give to every inventor of fire escapes full encouragement, and adopt when they have the opportunity, those they think most efficient. Mr. B. in his letter states that Mr. Wivell has taken an order to make one for the society for 24*l*., which statement (*if correct*), is a very good answer to his own question, for if the society did not think Mr. W.'s the most efficient escape they would not have given him the preference, especially if a more efficient one could be procured at *one fourth the cost*.

Yours most respectfully,

K. I. W.

London, Oct. 11, 1837.

P.S.—The society seeing the necessity of men being nightly in attendance with the escapes, have placed one with the escapes in the Strand, and one with the "Paragon" in Robert-street, Hamstead Road, which is drawn out every night in front of its station ready for operation.

IMPROVEMENT IN MOORING BALLOONS.

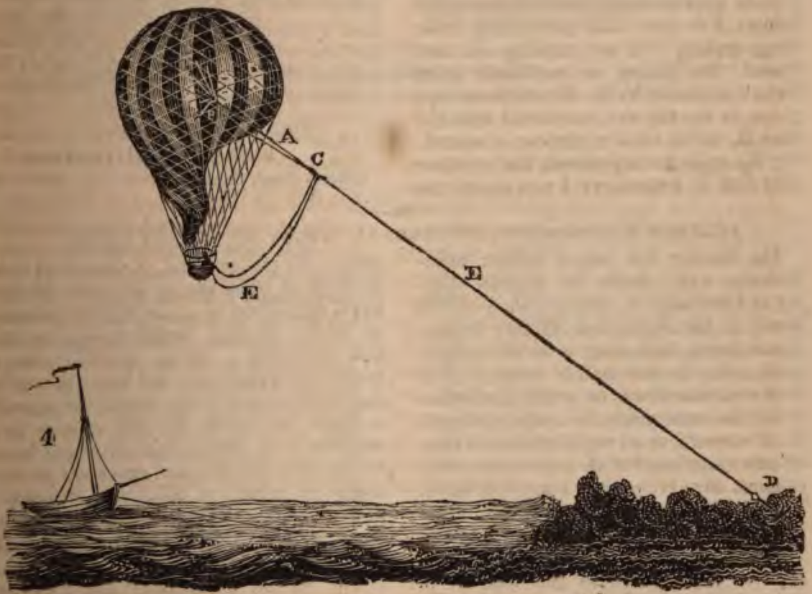
Sir,—At a time like the present, when the subject of aërostation is occupying so much of the public mind, perhaps you will not consider the accompanying diagrams, illustrative of an improvement in the mooring of balloons as unworthy of your pages. I have other suggestions to offer on the subject, should the present communication meet with insertion in your valuable periodical.

Fig. 1 represents the present plan of mooring a balloon, which, at the time of its descent, exposes the aëronauts to considerable inconvenience, and not unfrequently, to danger. A balloon is represented during its descent, having to contend with a stiff breeze. In consequence of the cable being made fast to the hoop of the balloon, the machine is much deranged, and leans over so much to leeward, that the car is thrown from its proper horizontal position to the imminent hazard of the aëronaut, and striking the earth in this position renders him liable to farther danger. Suppose we were to shift the cable of a vessel from its proper mooring, and fix it to the mast, the result would be as represented in fig. 2, and I apprehend the same fact holds good with respect to a balloon.

Fig. 3 represents a balloon descending with the same atmospheric vicissitude as in fig. 1; but in consequence of being moored in a different manner, its equilibrium is maintained, and the aëronaut saved a portion of the danger at least. In this plan it will be perceived, that the rope is attached to the body of the balloon, in the way that a cable is connected with the body of the ship, as seen in fig. 4. The two ends of an elastic rope *a* are attached to each side of the machine, by means of a number of small cords interwoven with the net-work at *b*. The middle of the rope is connected with a pulley *c* (for description of this see fig. 5) *d* is the grappling iron attached to the cable e, which passes through the check pulley

Fig. 1.

Fig. 3.



c, and is continued from thence to the the car.

Figs. 5 and 6 represent the pulley which forms the point of attachment between

Fig. 5.

6.

the cable and the elastic rope, and is constructed in the following manner: A is a ratchet edged pulley which contains a V groove, the sides of which are roughened to prevent the cable slipping, B is a horse-shoe shaped click which drops into the pulley by means of the spring C; D is the frame-work of the pulley, and contains an eye at each end; to one of these eyes E the middle of the elastic rope is attached; the other eye is for a rope which is to be used during inflation as described below; F is the cable proceeding from the grappling iron, and making one turn round the pulley is continued from thence to the car by G; H is a check rope going to the car, and connected with the click B, and is for the purpose of extending the cable to any extent the aëronaut may find it necessary; I represents the other eye in the frame-work of the pulley, and is designed for the purpose of facilitating the mooring of the balloon during its inflation, and to prevent dangerous oscillations in boisterous weather. This is accomplished by making a rope fast to a tree or any other object in the wind's eye, and passing the rope through the eye in question, and forming a bow there; the rope is continued to the car, and the aëronaut at the moment of departure will be able to liberate the balloon by simply pulling the rope by which the bow will be undrawn, and the rope will run through the eye, while the pulley falls to the network.

Your obedient servant,

EDWARD G. HITCHINGS.

4, Royal-street, Lambeth,
Sept. 18, 1837.

FURTHER EXPERIMENTS BY COLONEL PASLEY ON CEMENT BONDS.

On Monday last some further experiments were made by Colonel Pasley at Chatham, in the presence of the heads of the Naval and Military departments there, and many scientific gentlemen, upon the strength of cement. The first experiment was to ascertain whether a safe staircase might be made with artificial stones formed with bricks and tiles, or other small materials united with pure cement, strengthened by hoop iron bond.

A portion of the brick beam used in No. 2 experiment detailed in our last Number, in length 4 feet 4 inches, was inserted 9 inches into the wall of a stable; it consisted of four courses (two *more than is used in* a geometrical staircase); the extreme end of this step had no support whatever, so that we had the novel exhibition of a horizontal column of brick, retained together by cement and iron bars. Being loaded, it sustained the weight of 3566 lbs. Beneath the extreme end of the beam was placed a block to break the fall; when the weights were removed, and the block withdrawn, the column remained at the angle at which it fell, and required great purchase to remove it finally from the wall. Not one of the iron bars had given way.

The second experiment was for the purpose of ascertaining the force with which the hoop iron strengthened the

brick beams, by weights acting on a piece of hoop in a state of tension. In this case a piece of hoop iron, 12 inches long, similar to that used in the above experiment, sustained a weight of 6163 lbs., then yielded with a fair fracture; it was elongated ⅞ of an inch, and its temperature sensibly increased.

The third experiment was upon the remaining portion of the brick beam, built with Halling lime mortar, and strengthened with hoop iron, which was broken on the 28th ult., but one end of which was little injured. This beam was placed across two piers two feet asunder, so that the bars had very little room for extension; the experiment, however, was remarkable, for the beam sustained the weight of 4887 lbs. It did not give way suddenly; two bricks fell from the lower course many minutes before the final crash, and this did not occur until it had been yielding with a slow gradual motion. The fall was so tremendous that one of the piers were overturned, and scarcely two bricks were found together. So much for mortar. None of the bars were broken in this experiment.

It appeared in these experiments that the iron was corroded in the mortar, but not in the cement, another security of the latter over the former.

SPEED OF THE THAMES STEAMERS.

It is a fact, not more strange than true, that, while Dr. Lardner and his opponents on the question of the navigation of the Atlantic by steam, have been disputing as to the rate of speed attained by the American steamers on the Hudson—the one party asserting that they reached sixteen miles an hour; and the other, more than doubting the practicability of the feat—a reference close home would have settled the dispute, without the necessity of sifting the veracity of people some thousands of miles off. Dr. Lardner, after treating the assertion as a Munchausenism, observed that, even if it were true, it would prove nothing to the point, as the Hudson steamers, are, of course, exclusively river going vessels. But what could he have said to the fact, that at the very time he was so dogmatically laying down the law at the British Association meeting, some of our half-river and half sea-going Margate steamers were performing the distance between London Bridge and Margate Pier, at least *eighty miles*, in very little more than *five hours?* Yet no one was found to supersede the debate about the Hudson steamers, by referring to those of the Thames! Truly, as the eastern proverb has it—"There is darkness under the lamp!"

PROCEEDINGS OF THE LIVERPOOL MEETING (BEING THE SEVENTH) OF THE BRITISH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

President—EARL OF BURLINGTON.

September 11—16, 1837.

(Select notices, extracted and abridged from the Athenæum).

(*Continued from* p. 32).

SECTION G.—MECHANICAL SCIENCE.—THIRD SITTING—*continued.*

Mr. Mushet made some observations on Railway Iron, founded on experiments carried on for forty years. He expressed himself much surprised, that hitherto, in contracts for iron railway purposes, fibre and hardness were not stipulated for, but were left to the chapter of accidents. Both these qualities might be attained by his method, the principal characteristic of which consisted in doing away with the refining process now in general practice, and the preventing the severe decarbonization to which the iron was at present exposed. Several specimens of iron, of extremely fine fibre and hardness, were laid before the Section. The great object of his process was, to obviate the evil of lamination. On some railroads they had been obliged to lay the iron two or three times; but he had little doubt, that it would soon be possible to obtain a solid rail without any exfoliation.

Mr. Cottam mentioned, that he had known a piece of iron six inches thick, and considerably bent, to be quite straightened by blows, but, at the same time, to be greatly weakened; and that he attributed this to some of its constituent crystals being driven into it, by the force of the blows, like so many wedges, thereby weakening the strength of the iron.

Mr. Willis addressed the Section, and gave a brief exposition of a new method for the formation of the Teeth of Wheels. The present practice was, that a wheel of seventy-two teeth was adapted to one of twenty; but this would not work with one of thirty-five.

The method he now proposed would obviate this difficulty. It was founded on this principle, that if you take two pitch lines, and a tracing circle of any diameter, and if you trace an external epicycloid on the driver, and an internal one on the driven wheel, the two curves will move each other truly—it being necessary, however, in practice, to take a tracing circle of a radius equal to the radius of the smallest wheel of the set. The epicycloidal form, therefore, was decidedly preferable, as well from the accurate working of the teeth, as from the simplicity of the process, which was easily explainable to the workmen.—Mr. Willis mentioned, that Mr. Fairburn had furnished models made on the above principle, and that any pair would work together.—Mr. Willis then brought forward another form of teeth for cranes with heavy weights, with epicycloids in front, and back involutes. These will only move in one way, but are not liable to slip.

Mr. Currie made one or two observations on what he termed a Safety Railway; and Dr. Lardner then addressed the Section on his old subject—the application of Steam to long voyages. His remarks and calculations were, to a great extent, identical with those brought forward by him last year at Bristol, and published long since in his work on the Steam Engine, but the conclusions were somewhat varied; the Doctor did not now deny that the voyage might be *practicable*, but he did not believe that it would be *profitable*. — Mr. Cottam, in answer to Dr. Lardner's statement that the feathering paddle-wheels were better, but were three times as expensive as the others, and lasted only one-third of the time, mentioned, that he had some time since visited the *Firebrand*, after she had made two trips to Alexandria, and gone through very severe weather, and found her wheels, of the description referred to, so perfectly sound, that not even the oxide was off the joints: he did not believe such wheels to be either more expensive or weaker than others.—Mr. Rotch felt sure that Dr. Lardner's estimate of the speed attainable by steam-vessels was too low. For the *Dee* and *Medea* government vessels a rate was given of 8.3; but when the Doctor came to trading steamers, it rose to 9.9. What if it, in fact, were 15 miles an hour? The moment he turned to traders of the latest and best construction, up rose his maximum, and the London and Dundee steamers went far beyond it. Why too exclude the transatlantic steamers, the best of all? He had seen several gentlemen from America, and all agreed the voyage from New York to Albany was done at sixteen miles an hour. Mr. Hawkins mentioned, that it was certain that the voyage up the Hudson was made at fifteen miles an hour, including several stoppages for passengers.—Mr. Guppy said, the Government steamers, from which Dr. Lardner had taken his calculations, were very unfavourable specimens. Even on the *Medea*, the best of them, as she was built in 1832, there might now be considerable improvements. The *Berenice*, for instance, built in Glasgow, of 230 horse power, had gone from Falmouth to Teneriffe at an average speed of nine miles an hour, consuming 14 cwt. of coals an hour, with $6\frac{3}{4}$ lb. per horse power. From the *Atalanta*, of nearly the same horse power, nearly similar results had been obtained; and on one occasion, in a run of 2180 miles, she had made $8\frac{1}{10}$ miles an hour, consuming 11 cwt. of coal with 6 lb. per horse power per hour, having, at the end of her voyage, 175 tons still on board. He mentioned, also, that there was a new vessel just built at Bristol, which is to have two engines of 200 horse power each, with $73\frac{1}{2}$-inch cylinders, cycloidal paddles, and four distinct boilers, so distant as to allow room to move between them. Now, taking the burden of this vessel at 1300 tons; her engines, boilers, and their water, would weigh 350 to 400 tons, which left 900 tons for coals and cargo. Reckoning the average consumption in the best steam-vessels, it would be found that her engines would not consume more than 30 tons a-day,—so that, if necessary, she could carry coals enough for 30 days. If she were found to average nine miles per hour, (and he hoped it would be nearer ten,) she ought to perform her voyage in twelve, and, against disadvantageous winds, in eighteen days. He was therefore sanguine that steam navigation across the Atlantic would be shortly established. Another vessel is now in process of building in London, of 1800 tons, with 78-inch cylinders.—Mr. Muir bore testimony, from personal experience, that the speed of the American steam-boats on the Hudson fully equalled fifteen miles an hour. One of them, the *Rochester*, had paddle-wheels above 30 feet in diameter, and made 23 strokes in a minute. Another, the *Novelty*, had made 29 and 31.. The latter was 256 feet long, with large paddle-wheels, and narrow.—It was stated, in answer, to a question from Mr. Russel, that in the Hudson, for 120 miles, there was no impediment to speed from the depth.

Dr. Lardner replied; he spoke of Morgan's paddle-wheels only from report and the assurance of engineers. He had no means of procuring from America, notwithstanding all his zeal, those authentic data on which only could he consent to found calculations. He had found extreme caution requisite—even nautical dis-

tances were so inaccurately stated, that he had to get them calculated especially by Capt. Beaufort. He had not at all interfered with river navigation, nor was he satisfied with what he had heard. Those vessels were built for speed only. On the Hudson the boats were like canoes or Thames wherries, with the engines on deck. In an American sea voyage, thirteen British miles was stated an average. This was eleven geographical miles, or a speed of eleven knots. He had told them the *Dundee* and *Perth*, he had been informed, made ten within a decimal. One gentleman seemed to think fifteen was nearer their rate. He would tell that gentleman what he did. He applied to Mr. Napier, who gave him the particulars of ten double voyages, and from that Mr. Napier himself deduced the rate of ten knots. He was not able to deduce exactly the consumption of fuel, but, in a loose way, he would say that it was not less than 10lb. per horse per hour, perhaps twelve. Under these circumstances, he did not think they afforded a more favourable modulus, and therefore he used the *Medea*. His calculations were not founded on an average of steamers—old and new, good and bad—but on the *Medea*, and none else. He took her because she afforded the greatest average—most favourable to the project, and if any gentleman would put him in possession of a better, he would take it; but so long as he had not the precise facts he would not depart from her for ten thousand miles of Hudson voyages.

SECTION A.—MATHEMATICAL AND PHYSICAL SCIENCE.—FOURTH SITTING.

Mr. Lubbock read the Report of the Committee appointed to consider the proposition by him for the construction of new Empirical Lunar Tables.

The Committee were of opinion that the reduction of a considerable number of lunar observations would be an extremely valuable acquisition to astronomy; particularly all Bradley's, some of Maskelyne's, and all Pond's new transit and circle observations.

The step which the Committee now recommended, and which must necessarily precede any other, consists in the careful reduction of numerous observations, and in ascertaining the errors of given tabulated expressions, by comparing together calculated and observed places.

Sir William Hamilton concurred in the general statements contained in the Report. He was not acquainted with any subject of investigation upon which the funds of the Association might with so much propriety be expended, as upon that brought before the Section in this Report.

Professor Henry then made a communication respecting the Lateral Discharge in common Electricity.

The method of studying the lateral spark consisted in catching it on the knob of a small Leyden phial, and presenting this to an electrometer. The result of the analysis was in accordance with an opinion of Biot, that the lateral discharge is due only to the escape of the small quantity of redundant electricity which always exists on one or the other side of a jar, and not to the whole discharge. The Professor then stated several consequences which would flow from this; namely, that we could increase or diminish the lateral action, by the several means which would affect the quantity of redundant, or as it may be called, free electricity, such as an increase of the thickness of the glass, or by substituting for the small knob of the jar a large ball. But the arrangement which produces the greatest effect, is that of a long fine copper wire insulated, parallel to the horizon, and terminated at each end by a small ball. When sparks are thrown on this from a globe of about a foot in diameter, the wire, at each discharge, becomes beautifully luminous from one end to the other, even if it be a hundred feet long; rays are given off on all sides perpendicular to the axis of the wire. In this arrangement, the electricity of the globe may be considered nearly all as free electricity; and as the insulated wire contains its natural quantity, the whole spark is thrown off in the form of a lateral discharge. But to explain this phenomenon more fully, Professor Henry remarked, that it appeared necessary to add an additional postulate to our theory of the principle of electricity,—namely, a kind of momentum, or inertia, without weight; by this he would only be understood to express the classification or generalization of a number of facts, which would otherwise be insulated. To illustrate this, he stated that the same quantity of electricity could be made to remain on the wire if gradually communicated; but when thrown on in the form of a spark, it is dissipated as before described. Other facts of the same kind were mentioned; and, also, that we could take advantage of the principle to produce a greater effect in the decomposition of water by ordinary electricity. The fact of a wire becoming luminous by a spark, was noticed by the celebrated Van Marum more than fifty years ago, but he ascribed it to the immense power of the great Haarlem machine. The effect, however, can be produced, as before described, by a cylinder of Nairn's construction, of 7 inches in diameter, a globe of a foot in diameter being placed in connexion with the prime conductor to increase its capa-

city. Professor Henry stated, that a metallic conductor, intimately connected with the earth at one end, does not silently conduct the electricity, thrown in sparks, on the other end. In one experiment described, a copper wire, one-eighth of an inch in diameter, was plunged at its lower end into the water of a deep well, so as to form as perfect a connexion with the earth as possible; a small ball being attached to the upper end, and sparks passed on to this from the globe before mentioned, a lateral spark could be drawn from any part of the wire, and a pistol of Volta fired, even near the surface of the water. This effect was rendered still more striking, by attaching a ball to the middle of the perpendicular part of a lightning rod, put up according to the directions given by Gay Lussac, when sparks of about an inch and a half in length were thrown on the ball; corresponding lateral sparks could be drawn not only from the parts of the rod between the ground and the ball, but, from the part above, even to the top of the rod.

Mr. Snow Harris expressed an opinion, that the pressure of the air was an element in the phenomena not sufficiently attended to. He had produced beautiful illuminating effects by discharging electricity along a wire enclosed in an exhausted glass receiver. It was not, he believed, publicly known that even a glass rod, or rods of other non-conducting substances, became excellent conductors when placed in vacuo.—Mr. Ettrick said he had observed the illuminating effects spoken of by Mr. Harris when he used a leaden wire.—Mr. Addams confirmed the statements made by Professor Henry as to the illuminating effects of the lateral discharge; he had once seen, upon the discharge of a large electrical battery, a wire splendidly illuminated by the lateral discharge, and exhibiting the corruscations spoken of by Professor Henry.

Sir David Brewster then read a paper on "The cause of the Optical Phenomena which take place in the Crystalline Lens during the absorption of Distilled Water."

Dr. Reade next proceeded to explain his method of producing a permanent soap bubble for the exhibition of Newton's rings.

He exhibited to the Section several phials, about one quarter full of a solution of Castile soap in about two ounces of water. Upon giving these a gentle revolving motion, when turned upon their sides, a film was formed like a diaphragm across the phial, which speedily began to shew the most splendid band of colours. He explained, that the permanency of these films, which were, in effect, portions of soap bubbles, depended upon their being relieved from the pressure of the atmosphere, by immersing the phials in boiling water, and, as soon as the vapour generated within them had expelled the atmospheric air, corking them closely: as the contents of the phial cool, the pressure or elastic force of the vapour diminishes, and the films might be produced as seen.

Sir W. Hamilton said, that the simple and beautiful experiment they had just seen forcibly recalled to his recollection the words of Sir John Herschel—"To blow a large regular and durable soap bubble, may become the serious and praiseworthy endeavour of a sage, while children stand round and scoff; or children of a larger growth hold up their hands in astonishment at such waste of time and trouble."

Professor Christie then made a communication "On the occurrence of the Aurora Borealis in Summer."

The occurrence of an aurora borealis in England, in the middle of summer, was, he believed, a phenomenon hitherto unrecorded. He then gave an account of several very striking exhibitions of this phenomenon, which he had observed during the last summer. One, on the 19th of May, 1837, presenting two bands of arches, radiating from the magnetic west, and extending nearly to the opposite horizon, was unaccompanied by streamers. Another, on the 24th June, exhibited the usual appearance of coruscation from the northern horizon, but no arches were visible. This aurora, which was the most singular from being observed in the very middle of summer, lasted from $11^h\ 46^m$ until $12^h\ 20^m$ P. M. Other auroras were observed on the 1st, 2nd, and 7th of July, and 25th of August. On the last occasion, the author noticed a singular phenomenon, which he had, on one occasion, many years previous, observed, namely, that the darkness usually attending an aurora appeared to break into the light above it. He noticed that, on the former occasion, he observed the darkness to rush through, and finally break up, two well-defined arches of white light; and recalled to the Section, that Captain Back had described a very striking exhibition of a similar phenomenon, which he witnessed during his wintering at Fort Reliance. He particularly called attention to these and other phenomena, of the darkness exhibited in the aurora borealis, in connexion with the arches of light and the more brilliant coruscations. After recurring to other auroras which he had observed during the last summer, he inferred that it was probable that the aurora borealis was as frequently in activity in summer as during other seasons, though it might be less frequently visible. The author further stated,

that during the last twelve months, no period of a month had elapsed without the exhibition, in the south of England, of one or more auroras; and pointed out the importance of inquiring into the cause of the now so frequent occurrence of a phenomenon, which some years back had been very rare.

Mr. Stevelly stated, that the dark cloudy appearance during the aurora was so characteristic, that on one or two occasions, having seen, just before sun-set, these scattered black clouds, he was led to anticipate that an aurora would ensue, which accordingly manifested itself when it grew dark; and a friend, since he came to Liverpool, had boasted that he could unfailingly predict an aurora on the evening of the night on which it was to occur.—Sir David Brewster said, that, by an analysis of the light of the aurora borealis, he had proved that it was direct light, and had neither suffered either reflection or refraction.

Mr. W. Snow Harris made a report "On the Hourly Observation of the Thermometer, Barometer, and Wet Bulb Thermometer." Since his last report on the two years' Hourly Observations of the Thermometer, made on behalf of the Association at Plymouth, he had the pleasure of being able to say, that the register is now complete for a period of five years, hourly, without any intermission. The mean temperature of the five years differs only about four-tenths of a degree from that deduced from the two years' observations already given in the Report of the Association. The mean temperature of the two years, from 17,520 observations, being 52.90; that of the five years, from 43,800 observations, being 52.45.

Mr. Southwood followed with "An Account of his Observations with Mr. Whewell's Anemometer at Plymouth."

Sir David Brewster then gave an account of a new property of light discovered by him. He observed, that his attention had lately been drawn to a very curious, and, to him, entirely inexplicable property of light. While examining the solar spectrum formed in the focus of an achromatic telescope, after the manner of Frauenhofer, he placed a thin plate of glass before his eye, in such a manner as to intercept and retard one half of the pencil, which was entering his eye, by placing it before one half of the pupil. He was then surprised to find, that when the edge of the retarding glass plate was turned towards the red end of the spectrum, intensely black lines made their appearance, as might be expected, at such regular intervals, as to represent the most exact micrometrical arrangement of wires; but upon turning the plate of glass half round, (still keeping its plane perpendicular to the axis of the eye), so as to present the edge, past which the rays entered the eye, to the violet end of the spectrum, every one of those dark bands entirely disappeared. In the intermediate positions of that edge they appeared more or less distinct, according as the edge was more presented to the red, or to the violet, end of the spectrum. A glass plate, one-thirtieth of an inch thick, gave these lines; but the thinner the glass, the more intense was the blackness, and the more distinct the lines. They were formed in any part of the spectrum; but they were best seen when the rays were intercepted which lay between the two fixed lines A and D of Frauenhofer. An examination of these lines afforded the very best means of determining the dispersive powers of substances, for their distance from one another increases or diminishes exactly as the entire length of the spectrum is increased or diminished; and the number of them in the same part of two spectra is always the same.

(To be continued).

IRISH PATENTS GRANTED IN SEPTEMBER.

James Leonard Clement Thomas, of Covent Garden, for an improvement applicable to steam engines and steam generators, having for its object economy of fuel.

Edmund Shaw, of Fenchurch-street, stationer, for improvements in the manufacture of paper, by the application of a certain vegetable substance not hitherto used for that purpose.

John Isaac Hawkins, of Chase Cottage, Hampstead Road, engineer, for certain improvements in the application of the products of combustion in generating, and in aiding of, steam for giving motion to steam engines.

Thomas Hancock, of Goswell Mews, Goswell Road, for an improvement or improvements in the process of rendering cloth and other fabrics, partially, or entirely impervious to air and water, by means of caoutchouc or India rubber.

NOTES AND NOTICES.

Continental Railways.—It is now understood that the parties interested have agreed upon the direction of the line of railway between Paris and Brussels, which bade fair to become as great a bone of contention as the line of our own Brighton railway.—The Germans are in hopes, unless the French should display more activity in the matter than hitherto, of completing their continuation of the grand Belgian line before their rivals "on the other side" shall have made much progress in theirs. In that case, the strange spectacle will be presented of a line of rapid communication between Paris and Berlin, quite complete, *except so far as the French are concerned*,—a sad slur indeed on the nation which takes so much delight in ridiculing German sluggishness.—In Holland, the king has just confirmed the privileges of the company formed for the grand railway from Amsterdam to Leyden and the Hague, which, it is now determined, is also to extend to Rotterdam. The works have been commenced at three several places.

Egyptian Mode of Moving Colossi.—In the King's library at Berlin is an interesting papyrus representing the Egyptain mode of moving Colossi. The Sphynx being upon a sledge, the first line of labourers are placed very close to it, and the rope is ramified, after passing under each man's arm, so that every rank in advance doubles the number in the former line, just in the way that foreign heralds exemplify quarters of descent. A drummer appears to be giving time for a simultaneous pull, a process facilitated by several attendants pouring oil where the tire of the sledge is about to pass. The latter circumstance would lead to the supposition that Egypt in prosperity was not deep in sand, as at present, or else that the ingenious inhabitants used a temporary railroad for conveying their prodigious monuments, the oil alluded to being poured upon the flange or groove that received it. The former may, perhaps, solve the means by which the huge stones at Stonehenge and other ancient monuments in this country were placed in their situations.

Belgian Railroads.—The line by which the Belgians propose to connect their western boundry looking on the sea, with their eastern, bordering on Germany, is already so far completed, as to be opened from Termonde to Ghent. The ceremony took place on the 29th September: five locomotives drew a hundred carriages; music, fireworks, illuminations, and a banquet to king Leopold augmented the pleasures of the day. When the line is completed to Ostend, and a fast-going packet placed on that station, the journey from London to Brussels may be effected in sixteen hours. Just double the time, or thirty-two hours will be required for the passage from London to Paris, by a new route proposed by a French steam packet company, which intends to convey its passengers from London to Havre by a steamer, from Havre to St. Germain by the Seine, by a small boat, and from St. Germain to Paris by the new railway.

Price of Iron.—The contracts for the supply of rails for the Berlin and Saxony Railroad were taken by a house at Cardiff, and since that time there has been such an augmentation in the price of iron, that the shareholders, are congratulated on having saved, by "taking time by the forelock," no less than 100,000 dollars.

Poet Workmen.—It is singular enough, that Miller, the basketmaker, and author of "A Day in the Woods," has a namesake now in London, who is likewise both a workman and a poet. Nicholas Müller, a printer of Stuttgard, is author of a volume of poems which have attracted considerable notice in his own country,—Wirtemberg. He is now following his trade in London, where, although we can pretend no rivalry to the gigantic operations of the Parisian press in appropriating the works of foreign countries, there is still employment for some few printers of French and German. The king of Wirtemberg, in his recent visit to England, took notice of Müller, and presented him with what the Hamburgh correspondent calls a "truly royal" contribution to his support, and "further education." From the latter expression, it appears that Müller is following the old and approved fashion of the Germans, travelling to perfect himself in his trade. Those who are thus enabled, are, it is well known, often slenderly furnished with money, and looked upon as entitled, without any forfeiture of their respectability, even to beg on the road.

Pirates of Antwerp.—From the port of Antwerp alone, and in the month of September alone, printed books were exported to the value of 97,822 francs, or not a hundred pounds short of four thousand pounds, and it is supposed, that a much larger exportation of books takes place by land than by sea from Belgium, principally to Italy, Germany and Holland. Not one in a hundred of these works is of Belgian authorship or public property—they are almost all piratical reprints of Parisian copyrights, while the reading public of the continent is supplied with piratical reprints of all *but* Parisian copyrights by the Parisians themselves. The gunner is here indeed "hoist with his own petard."

Releasing Stoppers from Bottles.—Sir, as I have no doubt others of your readers, as well as myself, have frequently been inconvenienced by the stoppers of glass bottles becoming fixed, perhaps the following method of extracting them may prove useful to them. It was communicated to me by Mr. H. H. Clark of Sheffield, with whom it originated, and has, I believe, never been made public. Having wiped the neck of the bottle perfectly dry, and seen that the little groove or channel between the stopper and the neck is quite clean, pour into the groove a few drops of *spirit of wine*, and having set it on fire, let it burn out, and then immediately give the stopper a few gentle taps with a light wooden instrument, as the handle of a small spatula or chisel, and try to turn the stopper in an upward direction from *right to left*. I have in most cases found this effectual, but if it is not so the first time, it must be repeated.—J. Fordred.

St. Petersburgh and Zarskojeselo Railway.—The first public trial of the iron railroad to Zarskojeselo was made Oct. 7. It was five wersts in length, and begins in the midst of the city, near the church and parade of the Semenow Regiment of the Guards. The price of 2½ rubles for seats in the first and second carriages is considered to be much too high for such a short distance. A private trial of the two engines lately received from England was made on Tuesday. Though but a short notice was given, and only to the police, many thousand persons had collected to see this novel sight. Many persons crossed themselves at the sight of these gigantic machines, as if they had been demons.—*Hamburgh paper.*

Acoustic Telegraph.—A new telegraph has been invented in Austria by a M. Kfeninger. It is an acoustic telegraph, consisting of a tube in the form of a speaking trumpet six feet five inches long, which conveys the sound in 11 and 1-10th seconds to a distance of 12,000 feet. A trial made of this instrument at Vienna proved very satisfactory. The government intends to employ it in the army for the purpose of conveying military orders to troops dispersed over a great tract of land, &c.—*National.*

Brussels Improvement Society.—A company has just been formed under the name of "Civil Society for the Enlargement and Embelishment of the Capital of Belgium." The object of this new company is to build new quarters within or without the city of Brussels, particularly a quarter between the Louvain and Namur gates, to be called the Quarter Leopold. The capital of the company is five millions. The affairs of the society are to be managed by seven directors without salary, and a secretary.—*Brussels paper.*

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MUSEUM, REGISTER, JOURNAL, AND GAZETTE.

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SYMINGTON'S PATENT SYSTEM OF CONDENSATION.

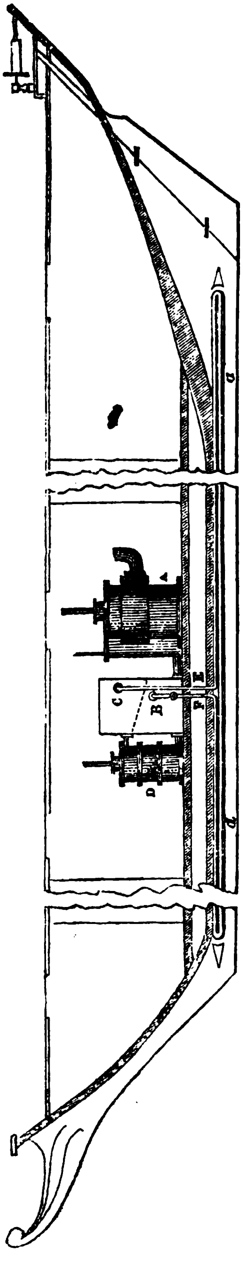

Fig. 1.

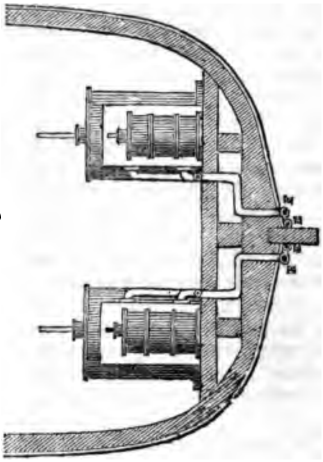

Fig. 3.

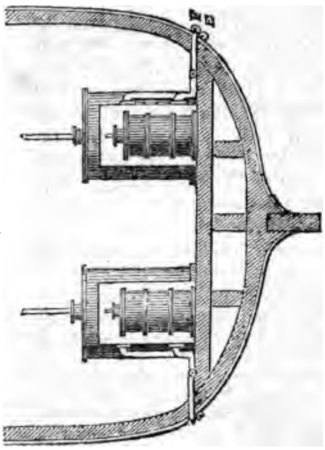

Fig. 2.

SYMINGTON'S PATENT SYSTEM OF CONDENSATION.*

The encrustation of the boilers of marine engines has been long acknowledged one of the greatest drawbacks to the application of steam to navigation: and the many evils arising from it, particularly in sea-going vessels, are too familiar to every practical engineer to require explanation. The great loss of power from blowing out the boilers; the great waste in fuel to supply the place of so much hot water; the valuable space occupied by a larger quantity of coals than would otherwise be required; together with the rapid wear of the boilers themselves, even under the most careful management; are among the disadvantages with which steam ships, engaged in the coasting trade, or destined for foreign stations, have to contend.

The inventor, who prides himself on being the son of the originator of steam navigation, thinks that he has devised a remedy for these evils, simple and cheap in its application, taking up no room, adding nothing to the tonnage of the vessel, and perfectly efficient in its operation. It appeared to him not a little singular that so many attempts should be made to condense *inside* the vessel by means of unwieldy tanks, which at the best must be but imperfect coolers, when there is so simple and perfect a condenser *outside* as the open sea or river. With this idea, the inventor thought that by cooling down the water in the hot well to the temperature of the external water, by means of a pipe, so placed *outside* the vessel as to receive the direct action of the sea, in order that condensation might be effected by injecting again and again a portion of the same water, while the remainder is returned to the boiler, he would succeed—more especially as such a plan would involve no alteration in *principle*—in producing a most simple and perfect mode of preventing encrustation, applicable with the greatest facility to any vessel in a few days, and without making any alteration in the engine itself. By his method, the injection-water, after condensing the steam, is conveyed in the usual manner by the air-pump, into the hot well, from whence a portion of it enters the refrigerating pipe at about 96°, and by the rapidity with which the pipe is brought into contact *with the constantly* changing particles of water by the motion of the ship, every portion of warmth is speedily given out; and long before the water completes its passage, it will become of the same temperature as the external water, and thus be ready for injection again.

It will be seen by the position of the pipes, that they are so embayed as to render it almost impossible for them to receive any injury, unless it be of such a nature as would be equally injurious to the vessel; but in the event of any unforseen accident occuring, as the old injection passage and discharge pipe from the hot well will be left free to act, the the engineer has merely to turn on the injection water, and the same process will go on as if they had not been attached. In vessels that take the ground at their mooring, the pipes can be placed with equal advantage, as represented in fig. 3, where they will be free from any danger.

The saving of expense by this plan from boilers alone would be important, as nothing can be more vexatious to a company than being obliged to lay their vessels up to have their boilers repaired or replaced with new, at a very heavy expense, and loss of time; in addition to this, however, a great saving in fuel will be consequent upon the adoption of the plan. The non-conducting nature of the crust which forms on the bottom of the boiler by the use of sea water, in spite of repeated blowing out, and the utmost diligence on the part of the engineer, renders an intense heat necessary to be kept up in the furnace in order to raise a sufficient quantity of steam to supply the engines, and thus a much larger quantity of fuel is consumed than is necessary with a clean boiler. The iron of the boiler is also exposed to the destructive effects of this intense heat without the protecting influence of the water, which is intercepted by the non-conducting crust.

Fig. 1, on our front page, is a side elevation of so much of a marine engine and vessel, as is necessary to show Mr. Symington's invention. A is the cylinder; B the condenser; C the hot-well; D the air pump; E the eduction refrigerating pipe, through which the water from the hot-well passes, and becomes cooled by the contact with the sea, as it passes along by the keel of the vessel, as at *a a*; then, being cooled, the water enters the condenser by the injection or induction pipe C, a portion of it acting

* See *Mechanics' Magazine*, vol. xxv. p. 295.

ıdensing jet, and the remainder to supply the boiler.

2 is a cross section of a vessel and ɟines, which shows more clearly tected position of the pipes, E F.

3 is another arrangment in which igatory pipes E F, are placed on ɛs of the vessel.

ad of the refrigerating pipe being ngle, it may be divided into a ıf small tubes, by which means ould be less projection upon the the vessel, and a greater cooling obtained,—although at a some-creased expense.

IE NATURE OF ELECTRICITY.

-According to the course pro-n a former letter (*Mechanics' Ma-* Dec. 10, 1836,) on the subject of ity. I commence by enquiring— electricity be matter? and un-head, first, whether it possess the to which materiality is essential, ravity? That it does, has been ed to be proved by experiment, ink not by the best method. An y conductor, however, intensely , has but a very small portion of ty compared with a Leyden jar, veigh a Leyden jar would be use-we know what one surface gains, ɛr loses. I propose to obviate ifficulties by separating the posi-e from the negative; placing the t one end of the balance, to make r; the latter at the other end of the to make it ligher. Thus arranged, ates would concur in producing ct sought for. To effect this, I uggest, that at each end of a ho-beam, balanced on knife edges, be placed a vertical circular con-formed of two flat parallel plates, ne inch apart, and rounded off at es, so as to unite and offer the obstacle to the exit of the elec-

conductors are intended as coat-one side of plates of air. The atings to be formed of fixed flat plates uninsulated, and of such at the suspended plates are far ir edges; indeed they cannot be e. These fixed plates may be parallel, to both of the sides or the suspended plates, so as to ne or both sides of the latter receive a charge. *The beam of ce should be nonconducting.*

There should also be metallic points placed opposite the exterior edge of each suspended plate, in a line with the balance beam; one of them connected with the prime conductor, and the other with the insulated rubber of an electrifying machine. Then the balance being made to rest as nearly as possible in equilibrio, is to be fixed; the electrifying machine, turned so as to charge the suspended plates as highly as possible; the charging points removed, and the beam released and left to the action (if any) of its electricity. The experiment should be repeated, reversing the positive and negative, and should the former descend in each case, it will not only prove the gravity, and consequently, the materiality of electricity, but also that the positive is the plus state.

It seems clear, that the opposed fixed plates, extending a considerable distance beyond the suspended plates in every direction, would have no power to determine either the motion or rest of the latter.

The stem of a common keck, or thistle, are the lightest things I know of that would serve for balance beams, and I presume would be nonconducting when well baked.

CORPUSCULUM.

October 8, 1837.

REMARKS ON THE SIXTH REPORT OF THE BRITISH ASSOCIATION.

Just at the period when all the world is at gaze on the proceedings of the British Association at their Liverpool meeting, the record of their doings last year, at the older commercial metropolis of the west, has very quietly stolen into existence.* The present volume forms only the fifth of the series, the reports of the first two meetings, those at York and Cambridge, having both been included in the first which appeared.

According to the now-established custom, the volume is prefaced by the Address with which the proceedings were opened, which, on the occasion of the Bristol meeting, it fell to the lot of Dr. Daubeny to prepare. This was the second time of the Doctor's officiating as one of the local secretaries, he having filled that office when the Association visited Oxford in the third year of its

* Report of the Sixth Meeting of the British Association for the Advancement of Science, held at Bristol, in August, 1836. Vol. V. London: 1837. Murray. 8vo. pp. 364-168.

existence, by virtue of his position as one of the professors of the University; and having been again selected, in the sixth year, on account of his being a Bristolian, "native, and to the manner born." It can hardly be expected that an Oxford professor should display so ample a share of oratorical excellence, as the Association had listened to the twelvemonth before, on the similar occasion, when the speaker was not only a warm-hearted Hibernian, anxious to do the honours of the capital to a whole host of distinguished visitors, but had had all his energies redoubled, and his thick-coming fancies, stimulated by the descent of the honour-giving sword of the Lord Lieutenant on his knightly shoulders! Alas! the blood of the men of Bristol runs more sluggishly through their veins, than the sanguine stream of a genuine Milesian, even though he should be devoted heart and soul to the dry study of the mathematics; and, worse than all, the "second city in England" holds no representative of Majesty, gifted with the faculty of quickening the circulation by holding forth the bait of courtly honours. It is not in the nature of things, that the peripatetic Association should often achieve a meeting so brilliant in respect to external show as the Dublin one of 1835; nor is it fairly to be expected that the "opening address" of succeeding years should display so many marks of spirit, or of inspiration from surrounding circumstances, as the favoured one of Sir William Hamilton.

It must not be supposed, however, that Dr. Daubeny has been slovenly in the performance of his task. Far from it. But he has laboured under many disadvantages, one of the most formidable of which happens to be inseparable from its nature, and from his own position. It every succeeding year, it must, of course, be found more and more difficult to say anything new on the standing subject of the discourse; the advantages, real or supposed, of the plan and constitution of the Association. To the first comer, "the world was all before him, where to choose;" but each of his successors, in turn, must have felt the difficulty of finding something new to say on a topic in some sort exhausted. Luckily, the peculiar "advantages" of the institution are in their nature something questionable; and this circumstance has given an opportunity for the initial speakers to impart a controversial air to their orations, and to launch out at length in defence of their castle of science, quite as often in repulsion of a mere imaginary, as of a real, attack. Dr. Daubeny partially avails himself of this approved system of tactics, and by far the most eloquent, if not the most convincing, burst in his discourse, occurs in that portion in which he seems, as it were, to stand on the defensive. From this portion, we shall extract the most novel and effective paragraphs. After enumerating the principal subjects to which the attention of the Association has been hitherto directed, Dr. D. continues—

"What proportion of such inquiries may be attributable to the influence of this Association, and how much might have been merely the result of that increased taste for physical research to which the Association itself owes its existence, I do not pretend to determine; this, however, at least must be be allowed, that many of the most important truths communicated, might have been long in winning their way to general recognition, and in ridding themselves of those exaggerated and mistaken views which are the common accompaniments of every infant discovery, had it not been for the opportunities which these meetings afford, of examining the very authors of them, with respect to their own inquiries; of confronting them with others who have prosecuted similar trains of research; of questioning them with respect to the more doubtful and difficult points evolved; and of obtaining from them, in many instances, an exhibition of the very experiments by which they had been led to their conclusions.

"And it is this personal intercourse with the authors of these great revolutions in science, which in itself constitutes one of the principal charms of these meetings. Who would not have listened with delight to a Newton, had he condescended to converse on the great truths of astronomy; to a Jussieu, imparting to a circle of his intimates in his own garden at Trianon, those glimpses with respect to the natural relations of plants, which he found it so difficult to reduce to writing; or to a Linnæus, discussing at Oxford his then novel views with respect to the vegetable kingdom, and winning from the reluctant Dillenius a tardy acknowledgment of its merits? And, in like manner, who does not value the privilege of hearing a Dalton discourse on these occasions, on his own atomic theory; or a Faraday (who, however, I regret to say, is on this occasion prevented by illness from attending) explain orally the steps by which he has paced the relations

ı electricity and magnetism, although ne is aware that the principal facts, th respect to one and the other, have ıce been made public by their re- : authors, and have been abundantly ıted upon by others?

d nowhere, perhaps, is it more de- o instil these sentiments, than within ;incts of those provincial cities which ociation now proposes to visit. The ınts of those great emporiums of ce and manufactures are, indeed, nough reminded that processes di- y the guidance of chemistry and me- constitute the very basis of their ity; but they are too apt to regard id other kindred sciences as the in- ıts merely of material wealth, and to superfluous to prosecute them fur- ın they are seen to conduce to that l.

at such notions are short-sighted, th reference to the practical applica- of the arts, it would not be difficult r; but I am ambitious to place the a on a higher ground, and the pre- mongst us of such individuals as I entioned, will do more towards that than volumes of argument would It will convince us at least, that oads to distinction, besides that of ealth, are opened to us through the ıentality of the sciences; for although, to the spirit of the age, which in this at least stands advantageously dis- ıed from those preceding it, the dis- s of important truths are not, as ore, allowed to languish in absolute , yet the debt which society owes to ould be but inadequately paid, were or the tribute of respect and admira- ich is felt to be their due.

ıas, indeed, been sometimes objected, large a share of public attention is age directed to the physical sciences, ıt the study of the human mind, the ion of literature, and the progress of : arts, have been arrested in conse- . In what degree the accusation is unded, this is not the place to in- although, when we look round upon ny literary characters that adorn this : should rather suppose the remark to risen from the increasing interest in , than from any diminished taste for tudies.

this complaint, however, had any ion in truth, it would only supply a r argument in favour of an Associa- ce the present, the express object of s, to correct that narrowness of mind is the consequence of limiting our- to *the details of a single science*, or *e, to a single nook or corner of one*, and, therefore, to render the prevailing taste of the times more subservient to mental culture, and, therefore, a better substitute for the studies it is alleged to have superseded; an Association, too, which, with no narrow and exclusive feeling towards those pursuits which it is designed to foster, extends the right hand of fellowship, to men of eminence in every department upon which the human mind can be exercised, and which would have felt that no higher honour could have been bestowed upon the present meeting, than by the attendance of the great poet, and the great sculptor, who own Bristol as their native city."—p. xxxiii.

It would be a pity to impede the current of the Professor's eloquence by inquiring too narrowly, what have been the important truths which have been sent forth to the world (stripped of their imperfections by the severe process of scrutiny so minutely described), through the medium of the British Association. He treads on far safer ground than this when he goes on to sketch the attraction held out by the meetings, in the presence of those distinguished philosophers whose discoveries, far, indeed, from being in an "infant" state, have "been made public by their respective authors, and been abundantly commented upon by others." The greatest scientific *debutant* brought forward at the Association meetings, was one who did not make his appearance till after the delivery of Dr. Daubeny's oration; Mr. Crosse, of Broomfield, of whose "infant discoveries" in electricity the Association took good care the world at large should hear quite enough. The readers of the *Mechanics' Magazine*, however, do not require to be told that the perfect *novelty* of Mr. Crosse's experiments is not a little questionable, while the world of lookers on have been surprised to observe, that it has been one of the objects of the Liverpool Meeting to undermine, if not to pull down, the very reputation which it was the highest boast of the Bristol Meeting to have built up! The only "authors of great revolutions in science" who have "constituted the principal charm of the meetings," have been authors of "revolutions" effected before the British Association came into existence, and established without the aid of the "opportunities" which its meetings afford of enabling new opinions to "win their way to general recognition."

The Doctor's remarks on the utility of encouraging a taste for science in

commercial towns, are much less open to objection· He is, however, unfortunate in his allusion to the peculiar claims of "chemistry and mechanics" to especial consideration, as it is has somehow occurred that these sciences, particularly the latter, (and most particularly that branch of the latter relating to its practical adaptation to manufacturing and commercial purposes), have unaccountably been left almost entirely out of view by the Association, and never, in fact, more so than since they have commenced the circuit of the larger towns, whose prosperity so mainly depends on the application of those very sciences to the business of life. In the volume before us, for instance, among the reports given there is not one having reference to a mechanical subject; and, in the second division, the "Proceedings of the Sections," the mechanical department is so miserably meagre, that it would seem hardly worth while to have a mechanical department at all. Yet this volume is occupied with the results of the labours of the Association in its very first visit to one of those "great emporiums of commerce and manufactures," whose inhabitants, according to Dr. Daubeny, were to receive so large a store of enlightenment on the sciences involved in their every-day pursuits from the wandering philosophers whose praises he takes upon himself to sound! As to the Doctor's defence of the age from the charge of a too-exclusive devotion to science, it is to be feared that it could hardly be palatable to those distinguished members present who have taken so much pains to prove that the age, in England, at least, pays scarcely any attention to science at all. But "who shall decide when doctors disagree?" Ere now, we have had one of the Association orators, lamenting the decline of science in a given sentence, and covering the whole race of living philosophers with eulogy in the next; so that, all matters considered, it is by no means improbable that Dr. Daubeny's apology for the preeminent cultivation of science in the present day, may have been received with acclamations by the crowds of distinguished declinarians who figured among his auditory. His observation in the concluding paragraph of the extract on *the absence of Southey* and *Baily*, the *"great poet and great sculptor"* of *Bristol, is doubtless* "founded on fact." Their presence *would* have been welcomed, doubtless, not surely because it would have been in any way beneficial to the cause of science, but simply, because it would have added to the attraction of the show! On the recent occasion of the Liverpool meeting, we are told that the country-people turned out in great numbers to see the "curious larned men" go by on their way to the Northwich Salt-mines; and it is the desire of gratifying a curiosity but a few degrees more refined, which brings together most of those spectators who are not also actors in the scene, at the annual gatherings-together of the Association. A "great poet and great sculptor" would certainly afford a refreshing relief among the mass of walking philosophers; but what end would be answered by their presence, beyond that of their exhibition *in propria persona*, to the gazing multitude? Messrs. Southey and Baily, perhaps, acted wisely by staying away.

Dr. Daubeny not only contributes the introductory discourse, but also commences the series of reports which compose the body of the volume, by a long, elaborate, and interesting paper on "the present state of our Knowledge with respect to Mineral and Thermal Waters," embodying a vast mass of information on the subject of which it treats, which had previously only existed in a scattered form in a vast variety of works, with a numerous array of facts collected by Dr. D. himself. It winds up with an excellent "Catalogue," presenting in a small compass a condensed mass of parparticulars relating to the thermal springs of Europe, which must alone have required the expenditure of no small share of industry and research. Captain Sabine follows with "Observation on the Direction and Intensity of the Terrestrial Magnetic Force in Scotland," a pendant to his paper read at Dublin on the Magnetic Force in Ireland, and the precursor, it may be hoped, of a similar one on England, which would complete the magnetic survey of the British isles.

The next report is one "on North American Zoology," by Dr. Richardson, of a very lengthy description, notwithstanding the author thinks it necessary to plead want of space for not entering further into detail. It is so lengthy, indeed, that, although Dr. R. speaks of it as only a sort of note to Mr. Jenyns's

"General Report on Zoology" in a former volume, is of equal dimensions with that paper,—about a hundred goodly octavo pages. The next paper, a "Supplementary Report on the Mathematical Theory of Fluids," by Professor Challis, is not in the same predicament; it is short, and full of matter.

Most of the remaining papers, with the exception of the last, which is a very searching "Inquiry into the validity of a method proposed by Mr. Jerrard, for Transforming and Resolving Equations of elevated degrees," by Sir William Hamilton, are extremely short, in some cases mere abstracts of the essays read, instead of the essays themselves. This is a new practice, as far as the reports are concerned, which have usually been given at full length, whatever might be the fate of the proceedings of the sections, in the after part of the same volume. Among the papers thus "shorn of their fair proportions" are some which give good promise, in the table of contents, of containing matter of high interest and importance: such as Mr. Lubbock's, "On the Discussions of the Observations on the Tides, obtained at the expense of the Association," and the report of the committee appointed to conduct "Experiments on Subterranean Temperature," both of which together do not occupy a twentieth part of the space devoted to Dr. Richardson's report on the Zoology of North America. Of course, they do not enter much into "detail"! There are two or three other papers of somewhat greater length, but these are on strictly medical subjects, and only serve to give rise to the idea that, as law and theology are expressly or tacitly excluded from the plan of the British Association, as well as from most other bodies devoted to the pursuit of general science, it might be worth while to extend the proscription to the third and last of the "learned professions"! Medical reports always smell too strongly of the shop to be palatable to any but medical men; besides, the M. D.'s have, or had, a sort of moving association of their own, with which they ought to rest contented, without intruding into one so much more extended in its objects as the British. The public in general have, besides, a different standard of feeling from the practised wielders of the knife, which renders the perusal of such papers as the "Report of the London sub-committee on the Sounds of the Heart" an affair of not the most agreeable nature. Suffice it to say, that it records with sufficient minuteness the results of a series of experiments both on the live and the dead subject:—the latter, always killed for the purpose, and often with torture, being a whole herd of *young* asses, and the former being, neither more or less, than the *old*—gentlemen who were entrusted with the inquiry,—and supplied with funds for the purpose from the coffers of the Association.

The latter portion of the volume is, as usual, occupied with the proceedings of the sections; which are given, also as usual, in most cases with compendious brevity. The following, which comprises some new particulars with regard to a substance of growing importance to the useful arts, caoutchouc, is a specimen of the more lengthy order:—

"Professor Royle stated, that he had been induced to draw up the substance of the present communication, in consequence of a conversation which he had lately held with the director of an extensive establishment for the manufacture of this substance into various articles of commerce, from whom he learned, that the demand at present exceeded the supply. Professor Royle asserted, that, in the East, there might be any quantity of the article procured from a great variety of plants, if the natives could only be induced to collect it with sufficient care. The South American caoutchouc is generally collected with so much greater care than that from the East Indies, that it bears a very much higher price in the market. That from the latter country is of excellent quality, but generally much mixed with a considerable quantity of dirt, bark of the tree, and other extraneous matter. Professor Royle then enumerated several of the uses to which caoutchouc is now applied, and stated, that the East Indian kind, from its great impurity, can only be used for the purpose of distilling from it the volatile spirit caoutchoucine. At the present time, the article from the East is selling at 2*d*. per pound, whilst that from Para fetches from 2*s*. 6*d*. to 3*s*. per pound. It is very remarkable, that a substance so incorruptible in water, and so insensible to a variety of chemical re-agents, should have remained so long unknown in Europe. Professor Royle then recapitulated the chief circumstances of its early commercial history, and

the method employed for procuring and preparing it. The substance is probably also produced in the southern parts of China, and is now exported from the island of Singapore. The Mauritius, Madagascar, Java, Penang, were then instanced as other localities from whence caoutchouc was obtained, and reference was made to the manner in which it was prepared in the latter country. By experimenting upon other species of the same families as those which were known to contain caoutchouc, it would probably be found that the list of plants from which it could be obtained might soon be much increased. Professor Royle then mentioned those families in which it had already been observed to exist in greater or less proportion. These were, the Cichoraceæ, Lobeliaceæ, Apocyareæ, Asclehiadeæ, Euphorbiaceæ, Artocarpeæ. It is remarkable, that many plants of the families which yield caoutchouc are characterized by the strength and tenacity of their fibre, and in tropical countries birdlime is prepared from plants of the same families. These observations, connected with the fact that the silkworm feeds on several plants of the families which yield the caoutchouc induced Mr. Royle to suppose that this substance might possibly form a necessary ingredient in those plants upon which only they can feed, and that it was in some way employed in furnished the material from which the tenacity was given to their silk. This induced him to inquire whether caoutchouc existed in their favourite food, the mulberry, and a friend having analyzed the juices of the plant, substantiated the validity of his conjecture."—*Abstracts of Communications*, p. 106.

We have already glanced at the extremely-emaciated appearance worn this year by the mechanical department, but our readers will hardly have suspected the extent to which retrenchment has been carried on this head. After all Dr. Daubeny's animating eloquence, it appears that the abstracts of the papers relating to mechanics, read at the Bristol meeting, can be contained in three pages out of the hundred-and-sixty, of which the "proceedings of the sections" consist! Alas! indeed, for practical science, if the only records of its progress were to be met with in the pages of the transactions of the British Association!

MR. WATSON'S CHEMICAL STILL.

Sir,—A few days ago, in looking over the pages of the last volume of your Journal (in No. 712, and at p. 504), I observed a description of an "improved chemical still," by Mr. Henry Watson, of Chichester. Were I personally acquainted with that gentleman, I would not take this means of informing him that his "improved chemical still" is not in the least, either improved or new; for stills of all sizes, on his plan have been used in and around Sheffield, for the purpose of distilling peppermint, &c. for the last *twenty years*..

A friend of mine at Brighton, likewise turning over some old lumber about three weeks previous to the appearance of H. W.'s still on the pages of your Magazine, found one *exactly* similar, in a situation where it must have remained at least five years previous to his bringing it to light. He subsequently had it repaired and cleaned, and has it now, I believe, in constant use.

By giving these few remarks an insertion in your valuable periodical, you will much oblige,

I remain, Sir,

Yours truly,

J. FORDRED.

Near Sheffield, Oct. 5, 1837.

ROYAL CORNWALL POLYTECHNIC SOCIETY.

On Wednesday (Oct. 11), and the two following days were appointed for the fifth annual exhibition of this important and interesting society. Mr. Davies Gilbert, V.P.R.S., presided.

Mr. Lovell Squire, read the report of the committee, after which, Mr. R. Taylor, Hon. Secretary, read the awards of the society on the following premiums :—

A premium of ten guineas, by G. C. Fox, Esq. for the best essay on the various diseases incidental to miners, their causes, and the best practical means of remedying them. Any statistical information as to their longevity, compared with that of the other population of the country, will be deemed highly desirable—1st silver medal, to Mr. Lanyon, surgeon, Camborne : premium still open for competition.

A premium of 10*l.* by J. H. Tremayne, Esq., for the best available method, or improvement on the plans already suggested, for facilitating the ascent and descent of miners.—1st bronze medal, to Mr. Jones, of Chacewater.

Two premiums, the first of 10*l.*, the second of 5*l.*, by H. H. Price, Esq., of London, civil engineer, one of the honorary members of this society, for the best plans adapt-

ing to steam vessels the method used in Cornwall, of working steam expansively; including practical drawings of the construction of the boilers and expansion gear. Such boilers should combine economy of fuel with safety, both as regards the danger from explosion, and accidents to the vessel from fire; with suggestions as to the best method of preventing the loss of heat, by radiation or otherwise. Due regard must be had to the essential difference between a single acting engine working pumps by a lever, and two double acting engines working cranks.—1st bronze medal, to Mr. J. Whitelaw of Glasgow.

Three premiums by C. Fox, Esq., the first of three guineas, for the best model (either original or copy) not less than eighteen inches in length, of a life-boat, which shall be judged must manageable in a storm;—the second premium of two guineas for the second best;—the third of one guinea, for the third best. Economy in the construction a great desideratum. — First premium awarded to Mr. Trevelyan, Camborne.—

Several other premiums which had been offered were not awarded,—either from there being no competition, or from the trials not evincing sufficient merit.

Mr. Squire then read the list of further prizes awarded, amongst which were the following for mechanical inventions :—

Improved printing press, J. Trevelyan, Camborne—1st bronze medal.

Instrument for drawing scrolls, J. Reynolds, Truro 2*l*.

Model of water whim, J. Arthur, Perran, —2*l*.

Improved bottle jack, N. Daniel, Penzance—1*l*.

For Drawings and Models of Machinery :—

Miner's dial, W. Wilton, St. Day—2*l*.

Model of steam engine, W. Gowan, St. Agnes—2*l*.

Spring hammer, Capt. Tregaskis, Perran, used at Wheal Vivian for breaking up tin stuff, &c.—1*l*.

Drawing of chain-proving machine, J. Coode, Bodmin—Prize 2d class.

Mr. R. W. Fox then said he had received that morning, a paper from a relative of his in Wales, Joseph T. Price, Esq., from which the following are extracts :

"Our experiment at Neath Abbey has shown, that, by combining a portion of bituminous coal, coked in ovens with a portion of anthracite, 20 cwt. of cast iron may be made by 33 cwt., ¾ths of the former, ¼th of the latter.—The iron made by using the hot blast is generally more tender, more lead-like, and more easily broken, than when coke or *bituminous coal only is employed.* By the use of the anthracite in the proportion stated, and also without any mixture of bituminous coal, it is materially stronger, and I should say better, and really more valuable as a marketable article, and for the uses to which it is applicable.—Our experiments are only commenced; I am, therefore, not prepared to state more than very general results.—When complete success had attended the use of the quarter part anthracite with three-quarters part of bituminous coke, we put on the furnace half of each. The result was that the change checked the make of iron one-half nearly—40 charges of iron-stone, coal, and coke in twelve hours were reduced to 20 by it, and consequently the yield of iron proportionately. However, we quickly returned to the quarter anthracite, and three-quarters coke." The letter went on to state that the advantages already obtained were a diminished consumption of fuel, and an improved quality of iron. The precise degree of improvement could only be generally stated at present.

Mr. Price proceeds to say—"I transmit a specimen of anthracited iron, made at Neath Abbey; I call it anthracited iron, because it was enriched and its nature strengthened, by a mixture of about a quarter part of anthracite, or stone-coal with three parts of coke, made in ovens from bituminous coal.—Before I close, permit me to offer through your society, a premium of ten guineas, for the best experiments, on the strength and tenacity of Anthracite Cast Iron, 1st and 2nd fusion, distinguishing the proportion of each kind of coal used, as compared with the strength and tenacity of Welch, Scotch, and English cast iron of parallel qualities, 1st and 2nd fusion, made with ordinary coal or coke, to be accompanied by a well-attested statement of the proportion of coal, anthracite, or stone-coal, and of the kinds of mine-ore and flux, used in the manufacture of each."

Mr. Fox then stated an interesting fact, mentioned to him by a gentleman from the Brazils, who had been engaged extensively in mining; that the veins there, as here, run north and south, exemplifying the magnetic power and the magnetic meridian. He said it might be remembered that he last year exhibited some specimens of copper ore, which had been altered by long-continued electrical action. He now produced some specimens of clay, in which veins and insulated portions of copper had been formed by the same agency. They were formed in masses of clay separating the copper ore from the zinc in the manner which he had heretofore described, and in which the electric action had long continued. He had also to lay before the meeting some clay which

by means of the same agency had assumed the laminated appearance of clay slate. (These specimens were then produced to the meeting.) Mr. Fox proceeded to say that it was not a little gratifying to him to present to the society such strong evidence in favour of those views; and which appeared to him to be no longer questionable, at least, as regarded the *laminæ* of clay-slate, and other rocks of a corresponding structure; and he thought it not improbable, that similar evidence might ere long be obtained, that the symmetical joints of rocks are due to similar agency.—Thus it appeared, he said, that the structure of rocks, had a direct tendency to confirm the theory which he had endeavoured to put forth relative to the formation of mineral veins: and the facts which from time to time had come under his notice, had tended more and more to satisfy him of the influential agency of electricity in their production. Indeed, he believed, that the structural and relative characters and qualities of coal-beds were also connected with chemical action.—Several other gentlemen then addressed the meeting, and some premiums announced for the next year.—Subscriptions were entered into to enable the society to build a gallery.

But one feeling prevailed on the occasion of this meeting, and that was one of high gratification at witnessing the important benefits which this society has already conferred on this county in particular, and on the country in general. The committee and every person connected with its management deserve the warmest approbation.

PROCEEDINGS OF THE LIVERPOOL MEETING (BEING THE SEVENTH) OF THE BRITISH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

President—Earl of Burlington.
September 11—16, 1837.

(Select notices, extracted and abridged from the Athenæum).

(*Continued from* p. 47).

SECTION B.—CHEMISTRY AND MINERALOGY
FOURTH SITTING.

Dr. Thomas Thomson read a report "On the Comparative Composition of Cast Iron prepared with the Hot and the Cold Blast."

Dr. Thomson observed, that the specimens of cast iron examined were all from iron smelted from the iron-stone in the Glasgow coal-field. This iron-stone is a carbonate of iron, more or less pure. The richest is known by the name of *Mushet's black band*, which occurs in the neighbourhood of Airdrie; its specific gravity is 3.0553, and it is composed of—

Carbonate of iron	85.44
—— of lime	5.94
—— of magnesia	3.71
Silica	1.40
Alumina	0.63
Peroxide of iron	0.23
Coal	3.03
	100.38

In the poorest specimens of iron-stone, the carbonate of iron amounts to only 29 per cent., but such specimens are rejected by the iron-masters. The ore is roasted, to drive off the carbonic acid; this, at an average, reduces the weight about 31 per cent.; it is then mixed with limestone and coal, and smelted.

When the Clyde iron-works were established, above forty years ago, ten tons of coal were requisite to produce one ton of iron. This coal was previously coked, by which rather more than half its weight was driven off under the form of gas, &c. By various improvements, the quantity of coal requisite was diminished from ten tons to seven tons thirteen cwt., and the quantity of limestone requisite for smelting one ton of iron was ten and a half cwt. When hot air (or air heated to above 607°) was blown into the furnace instead of cold air, it was found that coal could be used without being coked, and the quantity requisite to smelt a ton of iron was reduced to two tons nineteen cwt.; the lime was reduced to seven cwt., and the produce of iron in a given time from a furnace was more than doubled. The reason of this superiority of hot air over cold seems to be, that when the hot air enters the furnace it is immediately united to the coal, and is all consumed; whereas, the cold air partly passes up through the materials, and produces, as it ascends, a scattered and useless combustion. Hence, when hot air is introduced, the heat at the point of combustion is greater than when cold air is used. Hence, the smaller quantity of limestone requisite, and the greater produce in iron in a given time. The specific gravity of cold blast iron is lower than that of hot blast; the average of the former being 6.7034, and that of the latter 7.0623.

The following table shews the composition of six specimens of cold blast iron from different localities:—

	Muirkirk.	Ditto.	Ditto.	Pyrites.	Carron.	Clyde.	Mean.
Iron	90.98	90.29	91.38	89.442	94.010	90.824	91.154
Copper				0.288			
Manganese		7.14	2.00		0.626	2.458	2.037
Sulphur						0.045	
Carbon	7.40	1.706	4.88	3.600	3.086	2.458	3.855
Silicon	0.46	0.830	1.10	3.220	1.006	0.450	1.177
Aluminum	0.48	0.016		3.776	1.022	4.602	1.651
Calcium		0.018	0.20				
Magnesium						0.340	

The constant constituents were iron,[3] carbon, silicon, and aluminum; and manganese was a pretty frequent ingredient. The average proportions were—

$3\frac{1}{2}$ atoms of iron and manganese.
1 —— of carbon, silicon, and aluminum.

The atomic proportions of the carbon, silicon, and aluminum, were 4, 1, 1, so that cold blast cast iron may be considered as composed of—

21 atoms iron and manganese.
4 —— carbon.
1 —— silicon.
1 —— aluminum.

The following table exhibits the composition of hot blast cast iron, No. 1:—

	Clyde.	Carron.	Carron.	Clyde.	Clyde.	Mean.
Iron	97.096	95.422	96.09	94.966	94.345	95.58
Manganese	0.332	0.336	0.41	0.160	3.120	0.87
Carbon	2.460	2.400	2.48	1.560	1.416	2.099
Silicon	0.280	1.820	1.49	1.322	0.520	1.086
Aluminum	0.385	0.488	0.26	1.374	0.599	0,422
Magnesium				0.792		

These constituents are in the proportion of—

$6\frac{1}{3}$ atoms iron and manganese.
1 —— carbon, silicon, and aluminum.

In the cold blast, we have—

Iron.		Carbon, &c.
$3\frac{1}{2}$ atoms	+	1 atom.

In the hot blast—

$6\frac{1}{3}$ atoms	+	1 atom.

Thus, it appears, that hot blast contains only about half the foreign matter that exists in cold blast iron.

Cast steel made from the best Dannemora iron, had a specific gravity of 7.8125. Its constituents were—

Iron	99.288
Manganese	0.190
Carbon	0.388
	99.866

or it contained—

55.7 atoms iron.
1 carbon.

In reply to questions, Dr. Thomson stated, that he had made no experiments on the comparative composition of bar iron from pigs made with the cold and hot blast, and that he had not found any phosphorus in the specimens of cast iron whose analysis he had detailed.—Mr. Tennant stated, that the bar iron by the hot blast was equally tough, both *hot and cold*.—*Mr. Guest inquired of Mr. Tennant, whether in the* puddling, hot blast iron did not lose more than the cold blast iron: but to this no satisfactory answer was given.—Dr. Clarke contended, that as the impurities of cold blast iron are about double those of hot blast iron, it was impossible that, as suggested by Mr. Guest, this latter should undergo a greater waste in the process of refining. If such should be proved, he would consider it a chemical miracle. In continuation, Dr. Clarke observed, that manufacturers were too much in the habit of working by what he called the Rule of Thumb, and that, in particular, as the difference of the quantity of pig iron depended materially upon the heat employed; by not attending to this essential condition, iron-masters were liable to fall into erroneous conclusions as to the value of any particular improvement. Mr. Guest being called on by the President to speak to this point, stated distinctly, that he found the hot blast iron to lose more in puddling than the cold; and he had the impression that it was of inferior quality.—Dr. Thomson asked, whether the iron referred to by Mr. Guest was, or was not, made from cinder; to which Mr. Guest replied, that in some cases it was, but that his observations in reference to the greater loss experienced by hot blast iron in the refining surface was applicable to varieties in the manufacture of which cinder was not employed.—Professor Johnston expressed his surprise at the absence of phosphoric acid from the Glasgow iron, the more espe-

cially as in the Newcastle coal-field phosphoric acid is abundant, and the nodules of clay iron-stone, which may be considered as coprolites, always, as is well known, include phosphoric acid. He also stated, that as specimens of hot and cold iron have frequently the same physical properties, it is very difficult to pronounce upon the relative value of these processes. The white and black cast iron also may have the very same composition, and therefore the quality of iron must be referred to something totally extraneous to chemical constitution. In fact, quick or slow cooling will determine the pig to be of the one or the other colour.—The President observed, that though, generally speaking, black iron may be considered as yielding the best malleable iron, this could not, with any probability, be predicated of black cast iron got by the rapid cooling of the white variety, as suggested by Professor Johnston.—Dr. Thompson stated, that cinder is a mixture of silicates of iron; and subsequently expressed his conviction, that the quality of iron, notwithstanding what had been alleged to the contrary, is chiefly dependant on its composition, and that if phosphorus, for example, or sulphur, were present the metal could not be good. The same gentleman, in conclusion, decried the doctrine, which would place what was called the Rule of Thumb above what he considered a much more valuable guide—The Rule of Science.

Dr. Trail then read a paper 'On an Antimonial Compound applicable as a Pigment.'

It is made by adding a solution of ferrocyanide of potassium, to what he denominated the muriate of antimony, (we presume a solution of the sesquichloride of antimony in muriatic acid). The precipitate, which is of an ultramarine colour, he considers to be composed of prussic acid, iron, and oxide of antimony.

Dr. Arnott read a communication 'On an Improved Safety Lamp for Coal Mines.'

The principle of his lamp was, that the external air should be forced into the mine by the engine used for its ventilation, and that the pipes conveying the air should terminate in the lantern, which should be one of the ordinary kind, furnished with a chimney containing a valve opening outwards.

Mr. Ettrick made a few remarks upon Dr. Arnott's suggestion, expressive of his doubts as to its possibility and utility.

Mr. Pearsall brought under consideration, the action of water upon lead. He commenced by a reference to the researches of Colonel Yorke and Professor Christison, which demonstrate the corrosion of pure lead by water, though saline water does not dissolve it. (This fact was first noticed by Guyton Morveau.) The great object of his communication was to show, that rain water collected in leaden cisterns will dissolve the metal in considerable quantity, probably as hydrated oxide, but that, if such water be passed through a filter, or agitated with carbonaceous matter, it is altogether removed.

Mr. Mallet stated, that, according to his experience, lead alone is corroded which contains copper. This opinion was combatted on the ground, that all the lead of commerce includes copper.—Colonel Yorke also stated, on the other hand, that he had established that perfectly pure lead is corroded by water when it contains air; that the calx is of a crystalline nature, and composed, according to his experiments, of carbonate united to oxide of lead.—A gentleman, name not mentioned, stated, that the following experiment was instituted some years ago, and is still in progress. Into three bottles, filled, the first with Thames water, the second with distilled water containing air, and the third, with distilled water deprived of air, three slips of lead were introduced, and the bottles hermetically sealed. The lead in the first has been acted upon; that in the second has been still more extensively corroded; but that in the third continues perfectly bright. The oxidation of the lead is therefore, he concluded, obviously due to oxygen of the air.

Professor E. Davy gave an account of a new Gaseous Compound of Carbon and Hydrogen.

The gas, which is a new bicarburet of hydrogen, having been inclosed in a tube furnished with platinum wires, and subjected to a series of electric sparks, carbon was deposited, but there was no alteration of volume. This residual gas he conceives to be new. It is insoluble in water, not ignited by chlorine; exploded with one and a half volume of oxygen, it gives one volume of carbonic acid and some water. This gas would therefore appear to be a binary compound, and to be represented by the formula $C + H$.

SECTION C.—GEOLOGY AND GEOGRAPHY.
FOURTH SITTING.

A letter from Sir David Brewster, was read, containing a notice of a new structure in the diamond. This was discovered in an attempt lately made to form lenses for microscopes out of this valuable material. Some pieces being found unfit for the purpose, owing to their producing double images, these were discovered on examination to have parallel bands or veins on their surface, in the manner of a striped ribband; and consequently,

there is a structure in one band different from that of another, so that the whole surface presents a combination of various optical phænomena, and we may consider each band to possess a separate specific gravity, as well as a different refractive power. So strange a structure has not as yet been observed in any other substance, and it confirms the opinion of its vegetable origin—separate layers of vegetable matter having been subjected to a pressure, so great as to be wholly beyond our conception. — Mr. Sedgwick pointed out the well-known analogy between diamond and charcoal, which was more and more confirmed by this singular discovery. He wished also to mention a fact that was rather extraordinary—in the ashes of coal, forms of a vegetable kind and structure have been observed, and yet these were composed of silica.

SECTION D.—ZOOLOGY AND BOTANY.— FOURTH SITTING.

Mr. R. Mallet then read a paper "On the Power possessed by Aged Trees to reproduce themselves from the centre of the Trunk."

He observed, that trees, at a certain period of their growth, became decayed and hollow in the centre. This process was frequently followed by the splitting up of the tree, so as to make it resemble several trees, instead of one. He then described the process as arising from the power the bark possessed of depositing new wood, when the old became decayed. The new wood thus deposited, becoming covered also with fresh deposited bark, was the cause of the entire removal of some parts of the old bark, and the formation of the separate trunks alluded to. But the process did not stop here, as the deposition of wood kept on, and frequently filled up the interior of the tree, that had been formerly decayed. The centre of the tree appearing to be filled up with "liquid wood." In proof of his views, the author exhibited several drawings of fine old trees, as the Mulberry at Battersea, the Cobham Chesnut, the Fortingal Yew, a Beech in Windsor Forest, &c.—Mr. Mallet also exhibited some very fine specimens of crystallized Hæmatine, the colouring principle of the Logwood tree *(Hæmatoxylon campeachianum.)*

Professor Henslow differed from Mr. Mallett: he had seen tree grow within tree, and was more inclined to attribute it to the accidental deposition of a seed within the old tree, than to any deposition of new wood. According to Mr. Mallett, the growth of trees might be eternal, but this was an unphilosophical assumption. — Mr. Duncan stated, in confirmation of Professor Henslow's views, that he had seen a sycamore growing within a lime.

The President exhibited some wood from the new pier of Southampton, that had been attacked by the *Limnoria terebrans.* He had been applied to, by Captain Du Cane, Mayor of Southampton, for his opinion as to what was the best course to be pursued, as the existence of the pier was threatened by these devastating animals. He had recommended, that stone be substituted in the pier for wood. He believed that this was the only plan, for wherever wood was exposed to the *gentle action* of salt water, these crustaceous animals attacked it. They never attacked wood exposed to the more violent action of the waves of the sea.

The Rev. F. W. Hope stated, that a memoir had been published on this subject, in the last volume of the Transactions of the Entomological Society. He had recommended gas tar to be applied over the wood, but as this would require renewing, it would in the end be as expensive as covering the wood with iron, he should therefore prefer the latter plan.

The subject of the growth of trees being again introduced by Mr. Duncan, Professor Graham stated, that he had lately seen an instance, in which the branch of one fir tree had been transferred to another, by the union of the wood of the two branches, which had been accidentally brought together, and subsequently separated. He had seen also a beech and horse chesnut united, and another instance of union between the ash, elm, and holly, He thought it impossible, that the fluids of the different trees in these cases should be transmitted generally through the united trunks. There must be, however, organic connexion between these trees, and he was puzzled to know the kind of union that existed.—Professor Henslow doubted, whether organic connexion existed in the cases related; a very close approximation might take place, but he questioned the possibility of an organized interval.

SECTION E.—ANATOMY AND MEDICINE.— FOURTH SITTING.

Sir James Murray presented to the Section an apparatus for the purpose of withdrawing atmospheric pressure from the surface of the body, partially or wholly. He presented his reasons and observations to the Dublin Medical Section of the British Association, but they were not well understood, for want of apparatus and drawings. These he had now got, which, besides much labour and time, had cost upwards of 100*l.*; and he trusted, since he was becoming old, some of the members would perfect them. The first machine was for the whole body,

and resembled in form a slipper-bath, with the addition of a separate part to cover the upper portion of the body, the head only being free. The upper portion was luted to the lower, by means of a composition (used in making printers' rollers for inking the types,) and fixed in a groove; and, if necessary, the patient's face and head could be contained in a glass case, luted to the machine in the same manner, and respiration carried on by a tube. The air from the machine was removed by means of an exhausting syringe, screwed on towards the bottom part of this apparatus. He had tried this machine in the collapsed cases of cholera, and exhausted the air from the body, taking off one ton of atmospheric pressure. The consequence was, that the vessels became full and turgid, and the body, previously sunk, was rounded and red. He had tried it repeatedly, and the same results followed. The process might be reversed, and pressure of air made on the body, even to the amount of 100 tons, without damage; but beyond this it would not be safe. He had tried it repeatedly in asthma. The principle was applicable topically, and parts of the body could be submitted to the action of the machine, modified so as to be suitable to them. He exhibited a contrivance, of a long tin tube, made air-tight, and with a piece of wet bladder round one end, which was open; at the other end, which was closed up, a small exhausting air-pump was placed. A patient, with a paralytic wrist, put his arm into this; the wet bladder was tied round his arm at the top, to make it air-tight, and the atmosphere was then pumped out of the tube. The atmospheric pressure being taken off, the limb became turgid, the circulation was increased, and the part affected was soon cured. There was another adaptation of the same contrivance to the limbs, to draw off the effect of congestion of brain; and one to stop hæmorrhage in an injured hand, limb, or other extremity. An exhausting pump was fixed to the end of a bladder, the limb was put into the bladder, and the neck then tied round to makes it air-tight. The air was then completely exhausted by means of the pump, which compressed the bladder so close to the skin as effectually to stop even the pores of the skin. The same contrivance of a bladder and exhausting-pump was also applied for the cure of ulcerated legs, by preventing evaporation of the ulcers, by exhausting the air, and making the collapsed bladder adhere tightly all round. For irregular surfaces he thought the instruments of particular value, since no dry-cupping could be used there. If this plan had been known when those melancholy deaths from dissection cuts took place in Dublin, and dry-cupping could not be had recourse to, it would have been fortunate. The machine would be particularly advantageous in withdrawing blood from particular parts to others more remote. Thus, in cases of congestion of blood in the head, where bleeding had been carried to such an extent that it would not be safe to carry it further, owing to the great general loss in the circulation, blood might be made to accumulate in other parts, as in the legs. The case of a well known brewer in Dublin was treated on this principle, and recovered. Sir James then enumerated the kinds of cases where the apparatus might be used,—asthma, defective external circulation, aneurism, tumors, paralysis, &c.

SECTION F.—STATISTICS.—FOURTH SITTING.

Mr. Ashworth, of Bolton, opened the proceedings by reading the substance of "An Inquiry into the Origin, Procedure, and Results of the Strike of the Operative Cotton Spinners of Preston, from October 1836, to February 1837."

In October last there were in Preston and its vicinity forty-two cotton mills, giving employment to 8,500 hands, and requiring about 1,200 horse power to work them, and having a capital invested in them in buildings, machinery, &c. &c. of about £550,000 and working capital employed of about 250,000

making a total of £800,000

The number of operative spinners employed in these mills was 660, each spinner having under his care, on an average, about 600 spindles.

The following estimate was made of the direct pecuniary loss to all classes of operatives in consequence of the turn-out:—

	£.	s.
The wages of 660 spinners for 13 weeks, at 22s. 6d.	9,652	0
wages of 1,320 piecers .... 5s. 6d.	4,719	0
wages of 6,520 card-room hands, weavers, overlookers, engineers, &c. for 13 —— weeks, averaging 9s.	38,142	0
8,500		
Estimated loss sustained by hand-loom weavers, in consequence of the turn-out.	9,500	0
Estimated loss sustained by clerks, waggoners, carters, mechanics, dressers, sizers, &c. in consequence of the turn-out......................	8,000	0
Total.............	70,013	0

From which must be deducted—	
Estimated amount of wages earned, during the partial resumption of work, between the 9th of January and the 5th of February	5,013 0
Estimated value of relief given by the masters	1,040 0
Other private charity, and parish relief	2,500 0
Allowance to the spinners and piecers from the funds of the union	4,290 0
	12,803 0
Leaving a net pecuniary loss to the whole body of the Preston operatives of	57,210 0
(But to the town at large it may be said the loss of the whole sum of 70,013*l.*, as the amount of the deductions is mostly of a charitable nature.)	
The loss to the masters, being three months interest of 800,000*l.*, some of which, being sunk capital, was not only unproductive, but was taking harm from being rendered useless, has been estimated at	45,000 0
And the loss sustained by the shopkeepers, from loss of business, bad debts, &c.	4,986 0
Making the total loss to the town and trade of Preston in this unavailing struggle	107,196 0

Mr. Ashworth, in answer to a question from Dr. Smith, said, that the self-acting mule was only recently introduced into Preston, but that, wherever this machine has been established, the number of strikes has diminished.—Mr. Felkin observed, that the introduction of the self-acting mule was another example of the mischief which the workmen bring upon themselves.—Mr. Merritt stated, that inquires had been made into the nature of the expectations formed by the operatives during the recent turn-out among the builders in Liverpool, which proved that their objects were impracticable, and that the inevitable effect of even partial success would have been serious injury to themselves.—Dr. Barnsley declared, that during every strike and turn-out within his experience, disease and mortality had increased in a frightful ratio.

Dr. Yelloly read a paper on Spade Husbandry, similar in character to that which he had brought before the Statistical Section at the Bristol meeting of the Association. He stated, that later experiments have proved that this form of agriculture was even more profitable to the landlord, and beneficial to the peasant, than he had described it in his former paper: that the piece of land, referred to in the first report, was so productive, that the gentleman to whom it belonged had taken 100 acres, which was now undergoing cultivation by the spade, with every prospect of being as successful and as profitable in proportion as the smaller quantity upon which the report was founded.

Mr. Warner stated, that there were two parishes in England where poor-rates are known only by name, in consequence of the system of cottage allotment having been introduced by the landlords; one of these was Asweby, in Lincolnshire, the other was a place in Yorkshire, the name of which he had forgotten.—*Lord Sandon said he had* 300 such allotments, of about a quarter of an acre each, which he let out at about 2*l.* to 3*l.* per acre, and which returned to the occupier about 3*l.* per quarter.—Lord Nugent stated several beneficial results which had followed from the adoption of the system, and the chief of these was infant labour, which made every allotment an industrial and agricultural school.

(To be continued).

LIST OF ENGLISH PATENTS GRANTED BETWEEN THE 28TH SEPTEMBER AND THE 26TH OCTOBER, 1837.

Francis Hoad, of Demarara, but now of Liverpool, Esq., for improvements in making sugar. Sept. 30; six months.

Jonathan Dickson, of Charlotte-street, Blackfriars-road, engineer, for certain improvements in steam-engines, and in generating steam. Sept. 30; six months.

Thomas Clark, Doctor of Medicine, Professor of Chemistry in Mareschall College, Aberdeen, for an improved apparatus to be used in manufacturing sulphuric acid. Sept. 30; six months.

Joseph Whitworth, of Manchester, engineer, for certain improvements in machinery, tools, or apparatus for turning, boring, planing and cutting metals and other materials. Oct. 5; six months.

Ovid Topham, of Whitecross-street, Middlesex, engineer, for certain improvements in the construction of sluice cocks for water-works, and which improved construction of cocks, is also applicable to steam, gas, and other purposes. Oct. 5; six months.

John Loach, of Birmingham, brass-founder, for improvements in roller-blind furniture, and in the mode of manufacturing the same, part of which improvements are applicable also to other purposes. Oct. 5; six months.

John Thomas Betts, of Smithfield Bars, London, rectifier, for improvements in the process of preparing spirituous liquors in the making of brandy; being a communication from a foreigner residing abroad. Oct. 5; six months.

Antonin Pieux de Rigel, of Vienna, but now residing at Beaufort Buildings, Strand, Middlesex, engineer, for improvements in steam-engines. Oct. 14; six months.

Thomas Vaux, of Woodford, Essex, land-surveyor, for improvements in tilling and fertilizing land. Oct. 14; six months.

Henry Quentin Tenneson, late of Paris, but now residing in Leicester Square, Middlesex, gentleman, for an improved construction of the portable vessels used for containing portable gas, and of the apparatus or machinery used for compressing such gas therein; and of apparatus or mechanism for regulating the issue or supply of gas, either from a portable vessel or from a fixed pipe communicating with an ordinary gasometer; being a communication from a foreigner residing abroad. Oct. 19: six months.

Edouard Francois Joseph Duclos, late of Samson, Belgium, but now of Church, Lancaster, gentleman, for improvements in manufacturing iron. Oct.20; six months.

Henry Robinson Palmer, of Great George Street, Westminster, civil engineer, for improvements in giving motion to barges and other vessels on canals. Oct. 20; six months.

John Frederick Grosjean, of Soho Square, Middlesex, musical instrument maker, for certain improvements on harps, which improvements are applicable to other musical stringed instruments. October 20; six months.

Miles Berry, of Chancery Lane, Middlesox, C. E., for certain improvements in the preparation of palm oil, whereby it is rendered applicable to the woollen manufactures, lubricating of machinery, and other useful purposes to which it has not hitherto been applied, being a communication from a foreigner residing abroad. October 26; six months.

Miles Berry, of Chancery Lane, C. E., for certain improvements in machinery for heckling or combing, and preparing, and roving hemp, flax, tow, and such other vegetable fibrous substances, being a communication from a foreigner residing abroad. October 26; six months.

LIST OF SCOTCH PATENTS GRANTED BETWEEN THE 23D SEPTEMBER, AND THE 18TH OCTOBER, 1837.

Robert Smith, of Manchester, engineer, for certain improvements in the means of connecting metallic plates for the construction of boilers and other purposes. Sealed 2d of October, 1837.

George Whitmore, of Austin Friars, London, merchant and underwriter, in consequence of a communication from a foreigner residing abroad, for a new method of combining, by means of machinery and adhesive compositions, all kinds of fibrous materials, such as cotton, silk, flax, hemp, tow, fur, wool, hair, &c. into manufactured articles, which may be applied to the purposes for which paper, pasteboard, millboard, papier maché, parchment, vellum, leather, woven fabrics, felt, floorcloth, tarpaulin, and the skins of animals are used. Octoter 6.

Thomas Clarke, doctor of medicine, professor of chemistry, in Marischall College, Aberdeen, for improved apparatus to be used in manufacturing sulphuric acid. October 6.

James Potter, of Manchester, Lancaster, for certain improvements in spinning machinery. Oct. 6.

William Hearn, of Southampton-street, Pentonville, Middlesex, engineer; and William Davies, of Upper North Place, GraysInn Road, Middlesex, plumber, for a certain improvement, or certain improvements, in the construction of boilers for the generation of steam, and heating water or other fluids. October 13.

John Chanter, of Earl-street, Blackfriars, London, and of Upper Stamford-street, Surrey, Esq.; and John Gray of Liverpool, engineer, for improvements in furnaces and apparatus connected therewith, for locomotive engines, and for other purposes. Oct. 18.

NOTES AND NOTICES.

New Railway Power.—A proposition has been made, which has received a favourable consideration, for working an intended railway 300 miles in length, in the state of Virginia, in the United States. There are a series of waterfalls in the immediate vicinity of the whole length of the line, from which it is proposed to cut numerous canals to obtain a head of water for working water-wheels, to be applied in a similar manner as fixed engines for moving the railway carriages.

Safety Vessels. — The *Liverpool Standard* announces that the subject of the safety ships proposed by Mr. Williams in his paper before the last meeting of the British Association, has at length engaged the attention of government, and they are about constructing a series of steam vessels for the home and foreign service on this plan. The interior of these vessels being divided by numerous bulk heads, and not intended for merchandise, they may without inconvenience adopt this arrangement. Separate portions of the vessel, each water-tight. will be appropriated to the engine, boilers, cabins, store department, and for the accommodation of the crew, &c. An additional advantage arising out of this arrangement is, that in case of being fired into, they will not be in danger of that destruction which would inevitably follow a casualty of the kind to the present class of steam vessels. A very fine steamer, fitted up with three safety bulkheads, was this week launched from the yard of Laird and Co., at Birkenhead.

The Elgin Marbles and the Public Taste.—In the report of the parliamentary committee on arts and manufactures, it is recommended that casts of the best specimens of sculpture be transmitted from the metropolis to other towns, at the lowest possible cost, in order to facilitate the formation of galleries at various institutions, and therby disseminate good taste. This object has been opportunely advanced by the request of the French government to ours, for permission to have the Elgin marbles cast for the benefit of their national exhibitions. It was not considered advisable to trust the operation to any but the moulder usuallyemployed bytheBritishMuseum; but, in order to meet the wishes of our enthusiastic neighbours, Mr. Sarti has received orders to cast those valuable remains of antiquity; and the recommendation of the committee on arts is to be carried into effect by the sale of copies of those admired relics of Grecian taste, at the price of plaster and labour. This looks like encouragement to taste, and it is hoped that the managers of literary and scientic institutions will not neglect the advantage offered.—*Sunday paper.*

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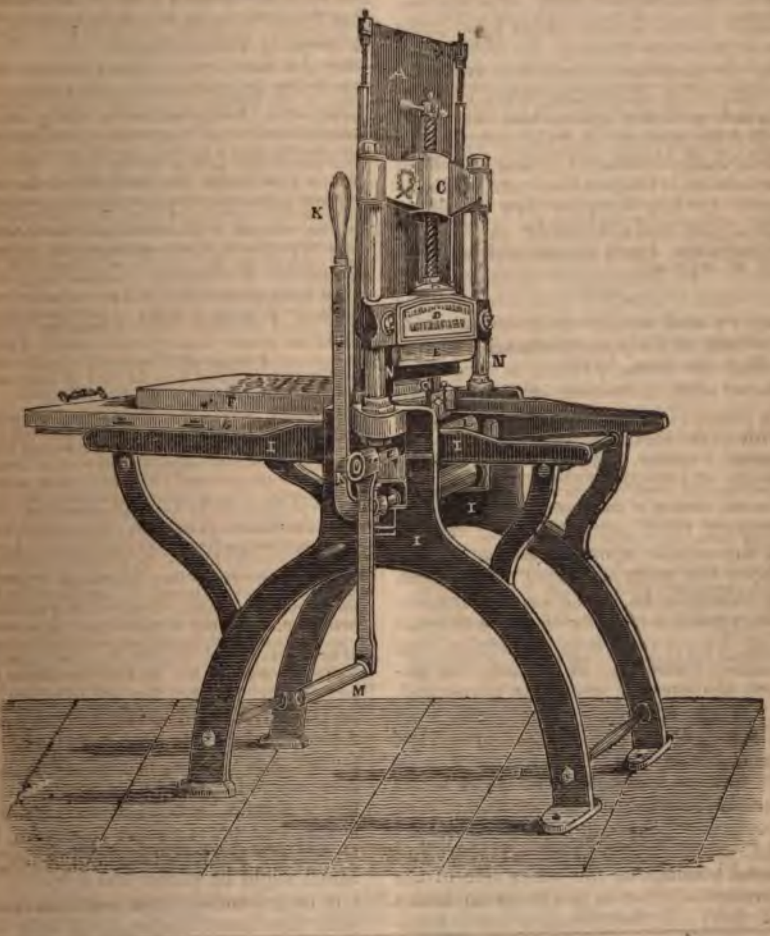
MUSEUM, REGISTER, JOURNAL, AND GAZETTE.

No. 743.] SATURDAY, NOVEMBER 4, 1837. [Price 3*d*.

GRANT'S IMPROVED LITHOGRAPHIC PRESS.



GRANT'S IMPROVED LITHOGRAPHIC PRESS.

Sir,—Until the invention by Mr. Grant of the lithographic press, a drawing and description of which I now forward you, lithographic printers were constantly subject to the annoyance of their presses getting out of repair by the breaking of the frames, cylinders, or other parts. This liability arises from the immense strain which is requisite to procure an impression in this kind of printing. Presses for printing lithograph require to be exceedingly strong: the process differs materially from either letter-press or copper-plate printing, the former giving its impression from the types by means of a descending mass of iron, turned perfectly plane, and which is called the platten; and the latter by the plate charged with ink, being placed on an iron table of great thickness, which is made to pass between two cylinders. (This plan was tried for the purposes of lithography, but I believe did not succeed). In lithographic printing, after the stone is charged with ink, and the paper placed upon it ready for printing, the head of the press, containing what is called the scraper, which is formed of box or other hard wood, is brought down by means of a lever, and its edge presses with great force across the tympan or leather, under which is placed the stone; the stone and carriage is then forced through the press, and the impression taken entirely by the friction of the scraper upon the tympan leather above the paper and stone. The strain is enormous to produce a good impression; and the cylinder on which the carriage for the stone rests is therefore continually breaking. To remedy this defect, the present press was introduced. IIII is a strong cast iron frame, from which project two upright cylindrical bars, NN, which carry the fixed head C, and the moveable head D; E is the scraper, formed of box or other hard wood; G is the carriage, on which is placed the stone to be printed from; HH are gun metal bearings on the under side of the carriage, sliding in a groove to lessen friction; A is the tympan, which is formed of leather, stretched on an iron frame, and greased; K is the lever, which gives the pressure; LL is the cylinder, on which the carriage passes; and M is the handle, by *which the cylinder is* turned. When the stone, F, is properly charged with ink, ready to give the impression, the paper is laid on it; the tympan, A, is then turned down over the face of the stone, and the carriage is run in to bring the scraper E over the stone F; then, by bringing the lever down to a horizontal position, by means of two eccentrics, one on each side of the press, it raises the cylinder L, and gives the required pressure on the stone. The stone is then passed under the scraper E, by turning the handle M, and the required impression is given. By returning the lever to its original position, the pressure is withdrawn, and the carriage may be drawn out; the stone is then ready for being inked for the next impression. The moveable head, D, is adjustable to the various thicknesses of the stones, by means of a screw B passing through the fixed head, C, and which raises or depresses the moveable head, D, as may be required. There are several of these presses at Messrs. Standidge & Lemon's, Cornhill, where they have given the greatest satisfaction; indeed, I have not yet heard of a single failure.

I remain, Sir,

Your obedient servant,

E. WHITLEY BAKER

15, Broad-street, City.

PICKLING TIMBER—OYSTER-SHELL MANURE—HYBERNATION OF SWALLOWS—LIGHTNING CONDUCTORS.

Sir,—In your last Number (740), I find two or three things that incite my remarks. First, I take the liberty of approving of "Old Oak's" views of the plan recommended by Dr. Granville for preserving timber by saturization in brine. I have seen timber as completely decomposed or "rotted" by long exposure to the action of salt water, as it ever could have been by fresh water; this I should be inclined to regard as a sufficient proof of the fallacy of Dr. Granville's proposal for pickling timber. Much might be said on the subject; but not to encumber your valuable pages with superfluous matter, I will only add, upon this head, that I have, ever since 1824, experimented on sub-acetate of lead, commonly called *sugar of lead*, and I find it as capable of arresting the production of the fungi vegetations called

"dry rot," by reason of its poisonous effects on vegetable life, as is the oxymuriate of mercury, employed by Mr. Kyan.

The difference in the price between mercury and lead, would, I think, give the employment of the latter the advantage over the former.

Your correspondent "Calx," give us a very useful suggestion upon the employment of oyster-shells for manure to land. It so happens, that for the last fifteen years I have been aware of their beneficial qualities as a manure, and have used them in my own garden with very evident advantage. It is necessary, however, to indicate to those who would try oyster-shells to their gardens, that in order to reap the benefit of the gelatine or glutine they contain, they must be broken into pieces, and the smaller the better. I place the shells on a stone pavement, and then, with a heavy mallet or sledge hammer, lay about me till I have smashed the shells into a hundred pieces each. A little method is good in all things, so I put five or six shells one on the other, the convexity upwards, and then, one blow reduces the whole to small pieces. Oyster-shells contain about six per cent. of extractive matter, including water, salt, and animal gelatine. A writer of a work, lately quoted by the *True Sun*, gives us the notable information, that lime is only beneficial to the land after it has been two years laid upon it; and that, therefore, limestone, or the hydrate carbonate, or carbonated hydrate, had better be applied in the shape of powder as a manure! How the agriculturists are to reduce to powder all the hard limestone to scatter over their fields, the gentleman does not say. So, we will say no more about so strange and difficult an operation.

From your same number (740), I learn that certain members of the British Association for the Advancement of Science, at present engaged in shedding the light of their knowledge over the people of Liverpool, declare the hybernation of swallows to be *impossible*, on physical and physiological grounds. A Mr. Pooley stated, that he had actually found three swallows imbedded in ice in Germany, which were in an hybernating condition, two of which were destroyed in extracting them; *but the third revived* and lived some hours. Passing over the remarks of the scientific gentlemen on this announcement, I will at once proceed to acquaint you with what I have heard on the subject. I dare say that you, Sir, have heard of Professor Morrechini, of Rome, the discover, in 1810, of the magnetic influence of the violet ray of the solar light. In 1812, I was fishing in the lake of Nemi, which is near Albano, about eighteen miles distant from Rome. Whilst my boatman was taking me across a part of the lake overspread with reeds, he remarked, that that was the place where the young swallows who were too late for the migratory departure of their tribe, plunged into the water to pass the winter; and he assured me, that he had often hauled up several in his net in the depth of winter, which revived upon being placed in his warm habitation, their feathers being quite dry, and surrounded, as it were, with an air bubble. Professor Morrechini, upon my mentioning the story, declared that he entirely believed it, for that he himself had seen, and held in his own hands, sixteen swallows that had been taken out of the lake of the Villa Borghese, all of which, from a torpid, benumbed condition, revived, and flew about his own apartments.

Further, Sir, I have to state, that, although I have never been so lucky as to see this interesting case of swallow hybernation, a friend of mine, who is as incapable of uttering a falsehood as he is of swallowing a camel, I mean the Baron de Bode, has assured me, that the fact of swallows passing the winter under water, in Russia, is as familiar to Russian peasants and fishermen, as it is well known to those of England that bats remain, during that season, suspended by the hooks of their hind legs, in some old wall or hollow tree, exposed to a degree of cold many degrees below the freezing point, and quite uninjured by its effects, cold to the touch as a lump of ice, and with their fluids, in all probability, congealed.

In the year 1805, the Baron de Bode, being sojourning at his estate of Ropsha, on the river Rasana, 20 miles from Narva, and 120 from St. Petersburgh, early in the spring, he was causing a kind of still "back-water" of the river, at that time very low, to be excavated for the sake of the rich black mud, for

manure. At that time, the work was facilitated by the whole mass of water and mud being congealed by the frost, so that the latter could be extracted in large blocks from under the ice, which was from two to three feet thick. Whilst his land-bailiff was engaged in this work, he brought to the Baron eight or ten black oval lumps, which had all the appearance of frozen black mud. These, to his surprise, he was told were swallows; and, in fact, after they had been placed for about half an hour in a warm room, and the crust of ice had melted, the birds were left perfectly dry, and shortly after, shewed signs of life, and then flew about the apartment. The Baron's bailiff, and other peasants whom he questioned on the subject, assured him that it was well known to them all; and, moreover, that swallows were often found in a much more unprotected state of hybernation, that is, in hollow trees, where they must be exposed to far many more degrees of cold below the freezing point, as it is likely that the air, in such recesses, must be nearly as cold as that of the surrounding atmosphere.

With respect to the physiology of the case, I can see nothing more surprising in it than in the hybernations of bats, dormice, some of the humming birds, and many other animals. But strange, or not strange, I as firmly believe it as if I had seen it.

In your same Number (740), I perceive that a question is mooted at the meeting of the British Association for the Advancement of Science, whether in the case of a certain "monument 140 feet high, erected on the summit of a mountain 1,400 feet high, augmented safety or danger would be the consequence of attaching to it a conductor or paratonnere?" I am induced to call the attention of your intellectual readers to this passage, as I am very sure that the subject is of great importance to society. About six months ago (vol. xxvi. p. 367) you honoured me by giving insertion to my account of a safety gunpowder magazine, in which I speak of lightning conductors, to which I would request your readers to refer. There is just now a gentleman, one Lieutenant Green, of the royal navy, who is endeavouring *to convince the public* by his writing, *that conductors are more prone to cause the damage they are intended* to avert. I must say, that I regard this statement as a mischief, for I have seen too much of the saving powers of conductors not to wish that every house in Great Britain were protected by one.

Lieutenant Green, in his anti-paratonnere pamphlet, lately published by Tanner, of New Bond-street, tells us of fifty churches in this country having been lately struck by lightning, because they had metal vanes! To be sure; but metal vanes are not conductors! and conductors should not be formed of a wire scarcely bigger than a bell wire! In my above quoted article, I have stated, that a tube is better for a conductor than a solid rod, because it is to the surface of bodies that electricity adheres. Nothing could be fitter for the purpose than iron gas pipes; but their connections and attachments, down the building, must be of stone, or other non-conducting materials.

Previously to the church of St. Peter's, at Rome, being protected by numerous conductors by the French government, damage was continually being done to the upper part of the stupendous edifice; but never was the least injury inflicted after the application.

It must be borne in mind, that an elevated and efficient conductor will give its protection more frequently in perfect silence and unobserved, than by conducting into the ground or water a positive discharge of electric matter, accompanied by a flash and thunder. The many-pointed conductors will silently draw off the electricity from a passing cloud, without any discharge, properly so called, at all; so that the blow has been parried, if it be not a *bull* to say so, before it is struck.

During my several sojourns at Rome, I have made particular inquiries into the effects of lightning on St. Peter's church. After the numerous substantial many-pointed conductors were affixed to the summit, and most prominent angles of the church, by the French in 1808, an electric discharge was not known to have fallen upon it more than three times, and then it did no injury. It appears that the clouds, in passing over the church, are deprived of their plus electricity by the conductors, just as a Leyden jar is silently equilibrized by the presentation of a metallic pointed conductor. How many ships would be saved from damage, conflagration, and,

perhaps, instant submersion, by properly constructed vehicles for conveying the electric fluid over the sides into the water? What inconvenience could be felt, from a branched rod and a chain from the mast-head, hanging along the shrouds into the water? All the failures of conductors arise from their want of sufficient mass of metal. A zinc chain or tube would be far less liable to oxidation than iron; and, as I have before remarked in the case of a powder magazine, &c., the metal might easily be kept with a clear surface, by an occasional rubbing with a brick-bat. About London, we see the conductors applied to the shot towers, tall chimnies, &c. not thicker than a quill, whereas they ought to be gas tubes of at least an inch in diameter. The top ought to be in the manner of a branch of a tree, with five or six points of copper gilt, the extreme points being of pure gold or silver, as are those at Rome.

In some volcanic districts, over which it would appear that the solidified crust of our globe, which covers the yet incandescent mass, is thinner or more porous than at other points, the electrical exchange of compliments between the earth and the atmosphere, are almost as frequently directed upwards from the earth up to the clouds, as in the contrary direction. Even against such upward discharges, the conductors, inserted in the earth, and ascending to the summit of the buildings, will preserve them from injury. I have witnessed a great many instances of ascending streams of electricity, some of which I have remarked upon in your pages, particularly in Nos. 401 and 402; and I am induced to think that we should see many more exhibitions of the process, were it not for the trees which act as silent conductors, both upwards and downwards. Electricity is the real food of plants, which they absorb through the innumerable points of their leaves and branches. On the same principle should a lightning-conductor be constructed, with as many points as convenient.

Lieutenant Green says, "seventy-nine churches in Great Britain have in a few years been struck; some of them destroyed; many, after being furnished with from one to four conductors. All of those struck had metal vanes." How *"many," out of the seventy-nine churches, were furnished with* conductors, this opponent to Benjamin Franklin, does not tell us? Any how, he only shews the danger of metal vanes inviting the lightning, without a conductor to take it away. A bit of wire attached to the walls by iron eye bolts or staples, is certainly more likely to cause mischief than give protection. A proper and elevated conductor will generally carry off the electricity silently without any apparent discharge.

I have the honour to be, Sir,

Your obedient servant,

F. MACERONI.

October 18th, 1837.

SOLUTION OF THE ASTRONOMICAL QUESTION PROPOSED BY "O. N.," BY HIMSELF.

Sir,—In compliance with the request of Iver M'Iver, I send you a solution of the question proposed by myself, No. 719, and also an explanation of the limits of the said question, suggested by Iver in his note, No. 735. Nautilus indirectly insinuates (No. 726) that the longitude of the place of observation forms no part of the elements necessary for giving a solution of the question; in this, however, Nautilus is wrong. It is very true, if the two observed celestial bodies happen to be fixed stars, and the only thing wanted is the polar angle Z P R (see my diagram, No. 732), then the longitude of the place of observation would not be necessary; but the thing wanted by Nauticus was a rule for determining the error of the clock or watch in mean, solar, apparent, or siderial time. In this case, the longitude (unless very small) cannot be dispensed with. Or it might happen that one or both of the observed bodies were planets, or the moon, and a fixed star, or planet; in either of these cases the longitude would be required on two accounts; first, in determining the angle Z P R; and, second, from the said polar angle in determining the time of observation. In the following solution, in order to see the effect produced by the longitude of the place of observation; I shall, instead of Edinburgh, suppose the longitude to be 150 west, the latitude 55.58 north, and the date Feb. 1, 1838.* Then by Iver M'Iver's astronomical rule we have

* I have taken 1838, instead of 1837, as at first proposed by me, as I have not the Naut. Alm. for 1837 by me.

$(a+b)$	128°..32′.. 1″	cosec...	0.106659
$(a-b)$	40..11..40	sin. ..	9.809818
$\frac{A}{2}$	18..15..42	cotan...	0.481517
x ..	68..12.. 4	tan. ..	0.397994
$\frac{x-A}{2}$	49..56..22	cos. ..	9.806624
b ..	44..10..11	tan. ..	9.987411
L ..	55..58.. 0	tan. ..	0.170468
y ..	22..12..55	cos. ..	9.966503

∴ 49°..56′..22″—22°..12′..55″ =27°..43′..27″= polar angle Z P R $=1^h..50^m..54^s$. From which the time of observation is determined as follows:—

R. A. of Capella		5^h.. 4^m..45^s
Calculated polar angle		1..50..54
R. A. of the meridian		3..13..51
Sid. time for mean noon Greenwich, Feb. 1, 1838.	20^h..44^m..59^s	
Sid. acceleration for 150 W.	1..39	
	20..46..38 sub.	
Sid. period from mean noon, Feb. 1, 1838..	6..27..13	
Retardation of the mean solar time for the interval	—.. 1.. 3	
Mean solar time of observation	6..26..10 P.M.	

From which it appears, that had we omitted taking the longitude into consisideration, we should have been in error one minute thirty-nine seconds, siderial time.

Iver M'Iver asks me to assign a reason, "Why the perpendicular P N must fall upon D Z produced?" I could give many reasons for this, but one will be sufficient; and that is, if the perpendicular P N did not fall upon D Z produced, then by a very simple calculation, it might be shown that the zenith distance of Procyon would be greater than 90°, which I suppose Iver will allow would be rather an inconvenient position for an observation; and here it may be observed, that by noticing the quality of the azimuth angle at the time of observation, that is, whether the vertical circle falls between the S and E, N and E, S and W, or N and W, the ambiguity can be removed.

Iver again asks me to determine the latitude of the place of observation, when the question just ranges within the limits of possibility; here, the only variable quantity is the latitude, and as that does not enter into Iver's first proportion, we must seek for it in the second, and the greatest limit will evidently be, when the cos. y = radius. In that case, the log. tan. L = 30—(9.806624 + 9.987411) = 10.205965; hence, the latitude is 58°..6′..14″. N, the azimuth, or spherical angle at Z would then be 90°, and consequently, the vertical circle passing through both stars would be due east, the arc y will vanish, and the polar angle Z P R would be 49°..56′..22″, and the time of observation will be 5^h 7^m $31\frac{1}{2}^s$ P. M. mean solar time.

I am sure Nauticus has every reason to be satisfied with the information he has received from Iver M'Iver and Nautilus. No less than four different solutions have been given for his astronomical question. Of the three given by Nautilus, his first is much better than either his second or third. His first solution only requires one table—namely, log. sines, tangents, &c. His second solution, which is derived from Dr. Tiark's equation is any thing but a good one; it is not only long, but it requires two different tables for its solution. It strikes me, however, that if Nautilus will again examine the equation,
$\frac{\sin.(x+a)}{\tan. d} - \frac{\sin.\ x}{\tan.\ D} = \frac{\sin.\ a}{\tan.L}$; and, instead of expanding, sin. $(x+a)$; if he would try and introduce some of Na-

pier's Analogies he might obtain a formula much better adapted (than the one he has given) for computation by logarithms. Nautilus's third solution appears to the eye to be as short as that of Iver M'Ivers. But Nautilus does not seem to be well satisfied with it himself; he remarks, "The necessity of converting logs into natural numbers, and conversely, adds greatly to the trouble and risk of error." His third solution requires no less than three different tables for its solution. Iver M'Iver's solution only requires one table—viz.: log. sines, &c., he determines the polar angle by two proportions. Nautilus requires three proportions for finding the same angle in his first and best solution.

I am, Mr. Editor,

Yours, &c.

O. N.

MERRYWEATHER'S PORTABLE FIRE-ESCAPE-LADDER CARRIAGE.

Sir,—Of all the qualities essential to the practical utility of fire-escapes, none has been so strongly, nor so universally, insisted upon, as *portability*. Portability, in its most comprehensive sense, implying not only the capability of ready transportation from street to street, but also the power of immediate application at the back or front of every building; capability of transit up the narrowest passages, up or down stairs, and even over roofs!

Among the several inventions now more particularly put forward for public adoption, with a view to facilitate escape from fire, none so completely meet all these exigencies as the portable fire-escape-ladders of Mr. Merryweather, especially in the form which I have now the pleasure of describing. The accompanying sketch exhibits the manner in which Mr. Merryweather has recently improved, or rather increased, the portability of *his escape-ladders*.

A very light-framed carriage, little more than 6 feet long, by 2 feet broad, furnished with springs and mounted on four wheels, *carries a set of seven of the portable ladders; they are placed in* three, side by side, with the top, or *escape-joint*, uppermost. If the top joint is used, the ladders can only be raised the right way; but if this length is omitted, it is immaterial which end goes uppermost, the ladder thus formed being as safe and as useful, one way as the other,—no small advantage to apparatus likely to be used in the emergency of "hot haste."

The weight of the ladders being little more than a hundred-weight, *one man* can run with them at a great speed, when thus mounted. I am disposed to think that a pair of larger wheels, placed under the centre of the carriage, would tend to make them run still lighter; two springs would be dispensed with, and the handle might be attached to the carriage direct, *truck-fashion*, or a small leading-wheel might be employed.

As the "Humane Society" have at length begun to stir themselves to some purpose, and are now adopting measures well calculated to give some chance of usefulness to their various fire-escapes, the above method of conveying their ladders may probably be beneficial to their plans. Since I last addressed you

on this subject, *three more* of the city parishes have adopted Mr. Merryweather's excellent fire-escape, and I would just state, that wherever there is any chance of this escape being needed at remote parts of an extended parish, or district, the above method affords the ready means of conveying it from place to place with unexampled ease, and at an extraordinary speed.

I remain yours respectfully,

WM. BADDELEY.

London, Oct. 26th, 1837.

TRANSACTIONS OF THE INSTITUTION OF CIVIL ENGINEERS.

This now-incorporated association has just made its first appearance in the literary world, by the publication of its proceedings during the sittings of the past year.* We are sorry that its *debut* is so little in accordance either with the station occupied by the Institution, or the importance of those branches of practical science which fall within the scope of its investigations; an octavo pamphlet of a couple of sheets could hardly be expected to contain the records of a whole season's labours of a scientific body, so extensive in the objects of its research, and so high in the reputation of its members. Every thing must have a beginning, however, and we are not entitled to conclude, from the scanty dimensions of the present production, that the succeeding volumes are likely to present so consumptive an appearance as this first of the series. We hope for better things, and do not despair of meeting with future tomes, devoted to the labours of the Civil Engineers, quite as bulky as the transactions of certain societies of older establishment; while they may easily be made ten times as interesting, and beyond all comparison more useful to "the world without."

It follows as a matter of course from the limited space allowed, that the abstracts, both of the papers and the conversations, are of the briefest description; so brief, that a very narrow outline, indeed, of each of the subjects touched upon is all for which room can be found; and the reader's appetite, though often whetted, is never satisfied with "solid lumps" of information. This procedure is most to be regretted, so far as the conversations are concerned; the papers may, perhaps, reach the public through the medium of some of the scientific periodicals; but the information elicited from the "contact of mind with mind" at the evening meetings, must remain a dead letter to all, except those present, unless the Institution itself take means to secure its appearance in an authentic shape. It must be conceded, that the task of reporting such conversations is one of a most delicate nature; yet the difficulty is not so great as to prevent the publication of reports much fuller than those now given. They are, in fact, so excessively short and incomplete, as to be almost totally useless, while the extreme caution, displayed in some instances, of suppressing the names of the speakers, gives the finishing-stroke to the interest of the papers in which it is adopted.

But for the uncommon fault of brevity, the "Minutes" would display no lack of attraction or instruction. Mr. Brunel contributed a memoir on the construction of the Thames Tunnel, which (the essay, we mean) is anything but a *great* bore, in the reduced form it is made to assume; and Mr. Perkins communicates a paper on the modes of generating steam for locomotives, the abstract of which may be read through before his steam-gun could fire a single million of bullets; and the celebrated Irish engineer, Mr. *Bald*, favours us with a variety of notices on the blasting of rocks, &c., which, in their abridged shape, bear rather closer a resemblance than might be desired, to the name of their author. One of the most prominent of the subjects handled at the conversations appears to have been the properties of cement, and especially Colonel Pasley's experiments on brick beams, the conclusion of which will be found in the recent numbers of the *Mechanics' Magazine*. The other leading topics were (as might be expected) various points in the construction of railways, the strength of materials, iron and wood especially; the ventilation of large buildings, and the illumination of lighthouses. Several of the matters which may be said to be now in controversy among engineers, also came under discussion; amongst them,

* Minutes and Proceedings of the Institution of Civil Engineers, containing Abstracts of Papers and of Conversations, for the Session of 1837. London. *Printed for the Institution.* 1837.

that puzzling one, the alleged amazingly high duty of the Cornish steam-engines. It seems to be at length settled that there is a good deal of deception, whether intentional or not, in those reports of duty which have excited the greatest surprise. Mr. Perkins, it will be recollected, asserts that the men are accustomed to play tricks by the admission of air, and the sketch of one of these conversations winds up with a few facts, which, if correct, go a good way towards "plucking out the heart of the mystery."

"With respect to the Cornish engines, it was stated that their superior duty is due to the system of clothing; that although many persons had examined their duty, the calculations appear to be made *from the contents of the working barrel;* that the *Cornish bushel is* 90 *or* 94 *lbs.* of a very superior coal, the London bushel being 80 or 84 lbs.; that, notwithstanding the great duty done by the pumping engines, the crank engines in Cornwall are doing *less duty* than the crank engines in London."—p. 16.

There is another matter of wonderment touched upon in the course of the conversations, which seems to have been allowed to escape without being "shorn of its fair proportions, and reduced to a matter of no wonderment at all; a fate which might well be anticipated when the subject came under the consideration of a band of English engineers· We allude to the speed of American steam-vessels, on which we are presented with the *viva-voce* evidence of an eye-witness, as follows:—

"Mr. Blunt had repeatedly gone a distance which he knew, from actual trigonometrical measurement, to be seventy-four miles, in five hours. The boats completed the distance from New York to Albany, not less than 150 miles, in fifteen hours. The speed of these boats, as compared with that of the boats in this country, is not to be wondered at, when it is remembered that the boats are built simply and expressly for speed. The Americans pay great attention to the form of their boats; the water is smooth; the engines are placed on the deck, and the boilers on the wings; and they spare no expenditure of power provided speed can be obtained."

Certes, the "speed of these boats, as compared with that of the boats in this country, is not to be wondered at," when the "boats in this country" go at the same rate.* But it undoubtedly *is to* be wondered at, that Mr. Blunt should have tendered his explanations of the phenomenon to a body of "civil engineers" without being informed that his wonder was no wonder at all. But far fetched information, it should seem, *must* be valuable!

* *Vide Mechanics' Magazine,* No. 741, p. 43.

While we are touching on the marvellous, let us quote an instance or two which belong to nearer home. Reader, "if you have eyes, prepare to rub them now!"

"The subject of the vibrations produced in the soil by the passage of locomotives and coaches was discussed, and several instances were mentioned in which the vibration of the soil was sensible at the distance of 1½ miles during an observation by reflexion. It was stated, that the experiments recently made for determining the effect which the passage of the locomotives at a small distance might have on the observations at the Royal Observatory had not been conclusive; but that as no sensible effect could be produced on any observations but those by reflexion, no apprehension of inconvenience was entertained.

"It was also stated, that a number of persons running down the hill in Greenwich Park produces a slight tremor, which is quite sensible during an observation by reflexion, and that *the shutting of the outer gate of the Observatory throws an object completely out of the field of the telescope!!*—p. 15.

From this, it is evident that the Cockney holyday-makers have much to answer for, unless, indeed, the Astronomer-Royal takes the precaution of making holiday at the same time, and so ensuring as much accuracy to his observations as can be attained while the outer gate of his mansion is subject to the usual fate of all his tribe!

The "Minutes and Proceedings" conclude with a list of subjects for essays, the most meritorious of which the Institution propose to reward with such premiums as the council may adjudge them to deserve, although they do not pledge themselves to grant a premium for each subject, and will consider papers on other topics of a kindred nature not disqualified to contend for a prize. It will be seen from this list (which we copy) that it includes a good many important heads, which, well handled, cannot fail to form a vast mass of interesting matter. It is this list, which, for one thing, leads us to hope for a more substantial volume next year; for it surely cannot be intended

to bury the prize papers, when produced, in the comparative oblivion of the repositories of the Institution.

The essays are to be on—

"1. The nature and properties of steam, considered with reference to its application as a moving power for machinery.

"2. The warming and ventilating public buildings and apartments, with an account of the methods which have been employed most successfully for ensuring a healthy state of the atmosphere.

"3. An account and drawings of the original construction and present state of the Plymouth Breakwater.

"4. The ratio, from actual experiments, of the velocity, load, and power, of locomotive engines on railways: 1st, upon levels; 2d, upon inclined planes.

"5. Drawings, descriptions, and account of the principles of Huddart's rope machinery at Limehouse.

"6. The sewerage of Westminster.

"7. Drawings and description of the shield at the Thames tunnel, with an accurate account of the method by which it is advanced and worked."

PROCEEDINGS OF THE LIVERPOOL MEETING (BEING THE SEVENTH) OF THE BRITISH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

President—EARL OF BURLINGTON.

September 11—16, 1837.

(Select notices, extracted and abridged from the Athenæum).

(*Continued from* p. 63).

SECTION F. STATISTICS.—FIFTH SITTING.

Mr. Urquhart read a paper, "On the Localities of the plague in Constantinople." He stated, as the result of three years' observation, that this disease, if it did not originate in localities close to cemetries, was greatly aggravated by the proximity of burial-grounds, especially when the towns and villages stood on a lower level than the neighbouring cemeteries. It was known, That the Turks from religious prejudices made their graves hollow, and placed a very shallow covering of earth over the dead. The mephitic vapours arising from the putrescent bodies, tainted and polluted the surrounding atmosphere: and that this disease was connected with atmospheric influences, was a fact known to the Turks themselves; among whom it was commonly said, that birds abandoned the localities where plague prevailed, and fruits became more abundant. Mr. Urquhart declared, that these observations were confirmed by his own experience; he regretted that he had no statistical data to offer to the Section, and hoped that, attention being now directed to the subject, it would lead to the prosecution of a more regular inquiry.

Mr. Wyse said, that his personal experience in Syria, Turkey, and Egypt, enabled him to corroborate Mr. Urquhart's statements; he had never passed the large cemetry, near the gate of Adrianople, without a distinct perception of noisome effluvia, which in humid weather was peculiarly offensive.—Colonel Briggs stated, that the plague was unknown in India, which he attributed to the custom of burning the dead. It was anciently unknown in Egypt where the dead were embalmed; among the Parsis, who expose their dead in a walled cemetry, to be devoured by the birds of the air, plague rarely or never occurs. In the countries which now constituted Turkey, pestilential diseases were very rare in the classical ages.

SECTION G.—MECHANICS.—FOURTH SITTING.

Mr. Lang addressed the Section on his improvements in Ship-building. His attention had been directed to the subject many years since, when employed in Plymouth Dockyard, where he was struck by the number of vessels sent in from the blockading squadron to be repaired, in consequence of injury done to their keels. He referred to many instances in proof of the advantages of the alterations he had suggested, and to the fact that the whole keel might be, and had been, as in the case of the *Lightning* steamer, swept away, and yet the ship continue on service without leaking. The following technical description of the plan we take from the *Liverpool Journal.*—"Mr. Lang fills up the floor perfectly solid, puts in a kelson and a keel in the usual way, bolting them well together and caulking all up. On each side of this keel he fixes another broad and flat one, and over these another, all secured in a peculiar way, by dovetailing, but so as one may come off without bringing off the other, and the whole without damaging the floor: over all he puts a false keel. The depth fiom the inside of the floor to the bottom of the false keel is about twice the depth of the kelson, and the

breadth of the three keels under the floor a little more than the depth from the top of the kelson to the bottom of the false keel. He caulks with Borrodaile's felt, observing that, when the seam is caulked in the usual way, outside and inside, the oakum does not reach the centre, but leaves a hollow, where damp lodges, to the destruction of the timbers." This plan has, it appeared, been adopted by the English and by foreign governments. It was, Mr. Lang admitted, rather more expensive than that usually adopted in building merchant ships.

Mr. Fairburn then read a paper "On the Tensile and CompressiveForces of Hot and Cold Blast Cast Iron," being a continuation of Tuesday's paper, from Mr. Hodgkinson's experiments.

The examination of the relative properties of hot and cold blast iron required that experiments should be made, in which the material was subjected to every description of strain. Leaving the power of adapting the experiments to the determination of some few questions of a more general nature; such, for instance, as the following:—The proportionality of the resistance to crushing to the area of section—The decrease of strength to resist crushing in long specimens, compared with those in short—The influence of form of section in resisting transverse strain—The strength of beams of best form compared with that of the rectangular. These questions, which have not been satisfactorily determined, have had considerable attention paid to them.

In order to ascertain the degree of accuracy of the admitted fact, that the strengths of rectangular beams are to each other as the square of the depth, castings were formed, one inch, three inches, and five inches in depth, and all of the same breadth and length; it is evident, then, that if the strength of each beam is divided by the square of its depth, the quotient should be the same quantity in each. On performing this operation, we have—

In Hot Blast Carron Iron ..	428.5	427.	402.12
In Cold Blast ditto. ..	445.8	416.7	414.5
Mean.	437.1	421.8	408.8

These numbers, taking the mean, are as nearly equal as perhaps may be expected in such a case; we may therefore admit that strength is as the square of the depth.

Compression.—In the fracture of bodies by crushing, there are three modes in some degree different from each other. For instance, when a cylinder of cast iron, whose length is several times its diameter, has a force applied to crush it, fracture will take place by the cylinder being broken straight across, as if the force had been applied transversely. If the length is small, fracture will usually take place by a wedge sliding off, the height of the wedge being about one and a half the diameter.

The strength of a cylinder is the same quantity, provided the length is not less than one and a half, nor greater than about three times the diameter. If the length of a cylinder is somewhat shorter than one-half its diameter, it will give way by the separation of a wedge whose vertex is bruised; and if much shorter, it will be crushed by the cylinder showing one or two cones whose bases are the ends of the cylinders, the truncated vertex of one cone splitting the base of the other. It is this tendency of crushed bodies to form two opposite cones, that causes cylinders or prisms to be bulged out in the middle before fracture.

The results of a great number of experiments, when reduced to one common denominator (one inch square), were nearly equal in the first (cold blast) iron, and not very different in the other. In the latter iron they were—

	lb.		lb.	
Cold Blast ..	124023	128478	123708	
Hot ditto ..	130909	131665	112605	111557

In the former, or cold blast iron, the area of the last specimen was to that of the first, as four to one, and in the hot blast the areas were as 6.55 to 1.

General Summary.—Strength of the different Irons.

Carron Iron, No. 2.

Mean ratio of transverse strength of cold blast iron to that of hot	1000	:	979.9
Mean ratio of cold blast bars to those of hot to bear impact	1000	:	1038.9

	Cold blast. lb.	Hot blast lb.
Tensile strength per square inch in cold and hot blast iron	———	13892
Compressive strength per square inch in each of the irons	100631	98125

Ratio of compressive to tensile force:—

(In cold blast iron this experiment was lost.)

$$\text{In hot blast, } \frac{98125}{13892} = 7.06342$$

rather more than 7 to 1.

The transverse strains, force of impact, &c. having been given in a previous Report (see vol. 27, p. 454), will be omitted in the following irons:—

Devon Iron, No. 3.

	Cold blast.	Hot blast.
Tensible strength, per square inch	——	21907
Compressive strength, ditto	——	145435

Ratio of compressive to tensible force:—

In cold blast, ———

In hot blast, $\frac{145435}{21907}=6.638$

Buffing Iron, No. 1.

	Cold blast. lb.	Hot blast. lb.
Tensile strength, per square inch, in each of the irons	17466	13434
Compressive strength per square inch	93366	86397

Ratio of the compressive to the tensile force:—

In cold blast iron, $\frac{93366}{17466}=5.346$

In hot blast iron, $\frac{86397}{13434}=6.431$

Coed Talon, No. 2.

	Cold blast. lb.	Hot blast. lb.
Tensile strength, per square inch, in cold and hot blast irons	18855	16676
Compressive strength, per square inch, in each of the irons	81770	82734

Ratio of compressive to tensile force:—

In cold blast iron, $\frac{81770}{18855}=4.337$

In hot blast iron, $\frac{82734}{16676}=4.961$

Dr. Lardner now offered some observations on the resistance on Railways. The first object said, Dr. Lardner, to which attention should be directed was the main points of resistance to be overcome by the locomotive power. He then detailed the nature of the resistance, and went over the principles expounded by Vince, Coulomb, and other writers on physics. He pointed out the difficulties of obtaining the truth by direct experiment, either by a dynamometer or by measuring velocities on inclined planes. The dynamometer he had found inefficient, owing to the inequalities in the surface of the rails, the needle dancing about so that no correct average could be obtained. Another obstacle arose from the necessity of knowing the exact inclination of the rails, in order to make due allowance both for gravity and friction. The change in this inclination he found to be very great, even where the supposed inclination as furnished to him did not indicate it. He had then tried the dynamometer first at one side of the carriages and then at the other, taking the mean indication. He had also taken the waggon first up and then down, in order to obtain the mean, but still the results were incorrect. He then suggested amendments in certain algebraic formulæ, which he contended were erroneous, the gyration of the wheels not being taken among the elements of the calculation. Thus much was merely *introductory to his own plan*, which was, to *take a train, load it up to the* full point, travel very slowly—say eight or nine miles an hour, and then, calculating the number of pounds' pressure on the piston, minus the momentum overcome, and the presumed friction of the engine, take the difference of the tractile force, on the basis of a uniform pressure of 50lb. per inch on the cylinder. This he stated to have been done, and produced the following formula:—

	Tons.	lb.	inches.
Engine	10.1		
Cylinder, diameter			14.
Cylinder, stroke			16.
Wheels, diameter			54.
Steam		50.	
Tender	7.		
50 Waggons	73.3		
Nett load	150.		
Gross train	240.4		
Limit of force on Piston		7696.5	
Mean leverage on cranks			10.16
Limit of Traction		2896.5	
Do. per ton		12.66	
Resistance per ton by gravity		3.40	
Limit of friction per ton		9.26	
Estimated adhesion		0.128	

The results led the Doctor to believe, that in the common estimate the friction was over-rated, and that it was probably less than 8lb. the ton. The principal novelty in the Doctor's calculations was the introduction of the gyration of the wheels, which had hitherto been disregarded.

The President inquired whether Dr. Lard-

ner had taken into consideration the resistance of the air.—Dr. Lardner said, the action of the air was so inconsiderable, that he had not.—The President observed, that in his opinion, the resistance of the air ought to be taken into account. The pendulum of a clock is doubly affected by the atmospheric air; first, by resistance, and second, by the *striking* of the air to the pendulum as it moves through it, which alone is so powerful, in astronomical clocks, as to make a difference of ten seconds a day. If such was the effect on a motion so minute and slow as that of a pendulum, what must it be, to say nothing of the direct resistance, on long trains forced through at high velocities?

Mr. R. Roberts, of Manchester, stated, that in 1824 he contrived a machine to enable him to ascertain the amount of friction, but without reference to the resistance of the atmosphere, and he found that as the velocity increased the friction rather diminished. He was convinced, however, that the resistance of the atmosphere should be taken into consideration, and in proof, he stated, that on one occasion, he was on the Manchester Railway in a hurricane, blowing in the direction of the railway, and so violent, that the power of the wind was sufficient to move the carriage even without steam. In this way he passed on at such a speed as to completely neutralize the effect of the hurricane—the effect generally was that of a calm. The observation of the President on the pendulums of astronomical clocks, reminded him of a curious circumstance which had come, some years since, under his observation, and was another proof of the resistance offered, under circumstances, by the air. Having made a top, which spun for forty-three minutes, he was requested to make another for a friend —this he did, and to give it a handsome appearance he had it lacquered, and then found it would spin only seventeen minutes; he accordingly removed the lacquer, and it then spun for thity-seven minutes.—Mr. Hawkins, in confirmation, observed, that inconvenience having been experienced from the resistance of the air on a fly-wheel, he had greatly diminished it by reducing the surface of the revolving bodies.—Mr. Hardman Earle said, he remembered, that during Dr. Lardner's experiments, at one or more of which he was present, the steam was blown off, and he mentioned several facts, showing the great irregularity in the performance of the same engine under circumstances apparently similar.—Dr. Lardner remarked, in conclusion, that he was convinced that the amount of friction could not be much greater than that now deduced, since the adhesion was found to be within a very small fraction of the theoretical adhesion.

The Secretary read a communication from Dr. Turner on a Safety Lamp invented by Mr. Leethead. The lamp is a brass cylinder with a glazed aperture; it is furnished with a hollow metallic sphere of about four inches in diameter, screwed to the bottom of the lamp, which it is proposed to fill with condensed oxygen gas. Of course, it would be required, that in all colleries where used, there must be a condensing apparatus and a quantity of condensed oxygen kept ready to supply the workmen.

Mr. Ettrick objected to the weight of the lamp; Mr. Evans said the ventilation was so imperfect that it would become heated.

The Secretary then read a paper by Mr. Curtis, on an Inflexible Suspension Bridge. The advantages of this were, first, the absence of vibration; and secondly, that each point of connexion was sustained by four opposite forces, viz.: two bars radiating from the opposite piers, and the two sections of the platform, which being fixed become, together with the bank, forces to sustain the bridge. Another important point dwelt on, was the absence of the main chain. In this bridge, any bar might be removed for repairs, &c., without insecurity.

Mr. Hawkins exhibited a machine for measuring the distance between the eyes, to be used in the construction of spectacles. This distance varied greatly, and was obvious in different nations, being much greater among the Germans than among the English. The instrument consisted of a graduated circular plate, with one fixed and another revolving arm.

Mr. Hawkins mentioned, that in the same individual there were frequently a great difference between the left and right eye; he knew a case where the focus of one eye was thirty-six inches, and that of the other only three.

Dr. Lardner corroborated Mr. Hawkins's statements, and gave the instance of Professor Airy, who had found that he was differently short-sighted in different directions; in fact, that his eye partook of the character of a spheroid, not of a sphere, and he accordingly got glasses ground on a spheroid, which perfectly suited him.

SAME SECTION.—FIFTH SITTING.

The Rev. Mr. Taylor, of York, made a Report on the different Modes of Printing for the Blind, prepared at the request of the Association. He mentioned several methods which had hitherto been adopted for this purpose. Hauy, in 1784, first invented the art of printing in relief, and in 1831 or 1832 Mr. Gall, of Edinburgh, introduced a triangular alphabet. At Boston the art has been carried to great perfection, several

books having been printed in modified Italics, with good and sharp impressions. The cost of a copy of the New Testament there was 2*l.* 10*s.* Other methods had been recommended, including arbitrary characters, contractions, fretted type, and a modification of the capitals of the Roman alphabet. Mr. Taylor, however, was strongly in favour of that adopted by Mr. Alston, of Glasgow,—viz.: the adoption of the Roman capitals deprived of their small strokes at their extremities, and cut with very sharp and thin faces. He objected to the use of what printers call the "lower-case" letters; and, in reference to the result of certain examinations of the pupils in their proficiency in particular systems, he observed, that the test of the merits of those systems was not the proficiency of the cleverest pupils, but of the bulk of them, and its adaptation to those who, as the vast majority of the blind must, would have the sensibility of their fingers impaired by labour. Several specimens of the different kinds of printing were handed round. Arbitrary characters he considered decidedly objectionable, as cutting off, in a great degree, the means of communication between the blind and others. For instance, at school, if the common type be used, the blind could learn with the other children, and get assistance from them. He was opposed to the use of contractions, and to printing on both sides of the page, as, in his opinion, they tended to create confusion. The children themselves declared that they preferred plain to fretted type; so that, in all points, Mr. Alston's system was the preferable one: of this Dr. Fry was the original inventor, but it had since been slightly modified. Mr. Taylor mentioned, that he was in the babit of corresponding frequently with a blind gentlemen on subjects connected with mathematics—that his letters were written with an ink formed of gum-water and lamp-black, and that the gentleman in question read them with little difficulty.

Mr. Oliphant mentioned, that during the previous week he had, in the Edinburgh school for the blind, seen children who were able to read the angular characters with eight or ten folds of a silk handerchief interposed between their finger and the book; and that Mr. Gall, jun., though blessed with the possession of sight, had, by constant attention, acquired such delicacy of touch, as to be able to distinguish letters cut on a small pica body, a size of type in which the common 8vo. Bible is frequently printed; and that he had little doubt, but that in a few years, instead of a single Gospel occupying a 4to. volume, as at present, the whole New Testament will be comprised in that *compass, and be sold at a price not exceeding 10s. or 12s.*

Mr. Russell then addressed the Section on Sea Walls and Embankments, following up the observations which he had made on previous occasions. There were three kinds of waves—the tidal wave, the wave of resistance, and a third species, which he termed the "secondary wave of the sea," with which sea walls had to contend. The object was to retard and diminish, or, if possible, annihilate the secondary wave. Its velocity, approaching the shore, was very nearly the velocity due to the fall of a heavy body through half the depth of the water; and thus, when speaking of the different forms of channels, he had mentioned, that by taking the centre of gravity of the cross section of the channel, you found the velocity of the wave. It was therefore retarded in shallow water, and then changed its form, especially in the anterior part, where it formed a breaking surface, or surge, which was very injurious in its effects. It might be useful, especially to vessels crossing an unknown bar, to learn, that the height of the wave was equal to the depth, provided there was no strong wind to break it; but that, in any case, the depth of the water might be greater, but could not be less than the height of the wave. It followed from this, that a wave might be compelled to break, by placing a body below, so as to make the depth less than the height. At present, various forms were given to the slopes of embankment—some were concave, and some rectilinear. The best form, however, was a convex one, with a parabolic curve, the slopes increasing as the squares of the distances, by which the wave would be made to break uniformly, gradually, further from the shore, and more effectually.

Mr. Russell, in answer to some observations, stated, that there were some modifications of the laws he had laid down, derived from the compressibility of water, &c., which he had not thought it necessary to introduce, as they were generally known; and that he had confined himself to endeavouring to make generally intelligible the results of his experiments. With respect to perpendicular embankments, he had known a very expensive pier built in that way nearly destroyed in four years. Such a form, in fact, has to *reflect* the wave, was well as break it; and this causes an evil of much importance to small vessels, for the wave thus reflected meets that which succeeds it, so that the body of one is thrown back into that of the other, the effect of which is, that the water, as it were by jolts, becomes at one moment very rough, and, immediately after, smooth, and continues alternating in this way.

Mr. J. Taylor (Treasurer to the Association) then came forward to answer any questions which might be put to him regard-

ing the duties of the Engines in the Cornish Mines. A grant of 50*l*. had been given by the Association for the collection of accurate information on this subject, and was likely to be renewed; and Captain Lane had in his possession reports of every engine in the country from 1813 up to the present time. Being asked, whether it was true that the engine, which Mr. Henweed, on a previous occasion, rated at 95½ millions of pounds of duty, had ever performed 125 millions, he appealed to Captain Lane, who said, he had been present an hour before the experiment began; that it was a perfectly fair one; and that the engine did perform 125 millions. The experiment, however, lasted only for about twenty-six hours, and Mr. Taylor agreed with Mr. Henwood, in attributing little value to one of so short duration. It was not asserted, that perfect accuracy could be obtained with respect to the quantity of water lifted; but they could approach sufficiently near it for all practical purposes. It was imagined that the reports were got up by the engineers; instead of which, they were a check upon them. Another test was found from the quantity of coal, which was well known; and the examination into the account books confirmed Captain Lane's report, and corresponded with the account of the duty. In the Consolidated Mines, they had 22 engines, some of them with 90 inches of cylinders, and a nine-feet stroke. The duty of each was reported every morning, and greatest emulation was excited among the men with regard to the performances of their respective engines. They felt, in fact, like grooms about favourite race-horses, and a great saving was experienced from the care taken in consequence.

Dr. Lardner then submitted for consideration a paper, by Professor Moseley, "On the Thrust of Arches."

Mr. Williams offered some observations, as a practical man merely, on a method for preventing accidents from the collision of steam-vessels, which was in practice in the vessels belonging to the City of Dublin Steam Packet Company. The danger at present arose from this—that a local injury, as in the late instance of the *Apollo*, admitted the water through the whole body of the vessel. The improvement would confine the water to the section in which the injury took place. It consisted in dividing the vessel into five water-tight compartments, by iron divisions or bulk-heads, the only objection with respect to which arose from the difficulty of fixing them in a timber frame. This was obviated by making the side of the vessel solid for twelve inches before and aft the bulk-head, and closing up the interstices with felt. *As to the number of these compartments, he had found, after several trials,* four bulk-heads, forming five sections, unexceptionable. The length of these sections was arbitrary; Mr. Williams made the centre one enclose the machinery, and those at the stem and stern of comparatively small length. He had, two days before, tried several experiments with the *Royal Adelaide*, having admitted the water by boring holes, first into the foremost section, next into the second, and afterwards into the third; and in each instance very little depression had been produced in the stem, never exceeding twelve inches, while there was no disturbance to the men at work. In cases of fire, too, there was a double advantage from this arrangement; the fire could not extend far under deck, so that the men could work easily in extinguishing it—there would be no current of air throughout, and the water might, if necessary, be admitted to the section attacked by the fire, without any general inconvenience, and without any danger.

(To be continued).

NOTES AND NOTICES.

Foreign Railroads.—The special land of the "mountain and the flood," has felt the influence of the universal desire for the rapid locomotion. The Chamber of Commerce at Zurich, held a meeting on the 4th instant, respecting the propriety of establishing a Railway in Switzerland. It was unanimously agreed that the main line must be one leading from the Rhine to Italy, and that whatever matter should be first undertaken, should be a portion of this principal thoroughfare of the nation. A meeting was summoned for the 23rd of this month, of Deputies from all the Cantons on the whole line, to consider the question. If this undertaking be ever accomplished, the famous road over the Simplon must hide its diminished head. Perhaps a few years may see the herd of travellers taking their way to Italy up the Rhine, and over or under St. Gothard. In Austria it is expected, that next month will witness the opening of the Railroad from Vienna to Wagram, the scene of Napoleon's victory in 1808. The steam-carriages are already arrived, and some articles of particular splendour have been prepared for the use of the Court, on occasion of the opening. In Belgium, the works for the Railroads are carried on with the usual activity. The road from Bruges to Ostend is expected to be ready by the 1st of May 1838; and that from Ghent to Bruges still earlier, it is said in February. Eighteen locomotives are already in action on the Belgian Railroads, and three more are daily expected from Cockerill's works, at Setaing.—*Railway Times.*

Brighton Chain Pier.—An object which attracted considerable attention, upon her Majesty's visit to the pier, was the splendid pier vase which was presented to Captain Brown, R.N., by the commissioners, inhabitants, and visitors of Brighton, when the pier was opened in November, 1828.. The cover is surmounted by a figure of Britannia; the first belt contains the inscription, encircled with chain cables, invented and introduced into the King's service, by Captain Brown, in 1810. The handles of the vase are formed by two improved anchors expressly adopted for the use of chain cables. Round the body of the vase is a perspective view of the chain pier in the finest workmanship. The vase is supported by a tripod of dolphins—the ancient Brighton arms. The vase holds three imperial gallons, weighs 360 oz., and cost 350*l*. The inscription runs as follows:—"Presented to Captain Samuel Brown, R.N., by the commissioners, inhabitants, and visitors of Brighton—the testimony

of his public spirit displayed in the construction of the chain pier."

Manufactures of Lancashire.—Probably the largest entire room for manufacture in this county, and if so, in Europe, is that of Messrs. T. and E. Grundy, at Heap-bridge, near Bury. It is appropriated to the manufacture of woollens, and is 85 yards in length by 75 in width, and 12 feet in height; is supported by 253 pillars, some of which also bear gearing; it has 65 large windows, and 253 skylights; 672 feet of steam piping run through it, and about 2,688 feet of shafting are at work. It contains, or will contain, eight carding engines, probably the largest in this county; eight gigantic slubbing frames; 40 mules; 200 looms, some for weaving prials, three in width; 450 gas jets; will be worked by one engine of comparatively small power, and is surmounted by a funnel of 69 yards and two feet.—*Bolton Free Press.*

The Raising of the William.—Much interest has been excited by the various methods adopted for raising the two vessels, the Apollo steamer and the William of Sunderland, both sunk near this town. The first was to have been raised by means of air bags, and the latter by cylindrical air cones. Through Mr. Kemp, the inventor of the latter apparatus, a number of scientific gentlemen, who take a great interest in the success of this novel means of raising vessels of any magnitude, have inspected not only the working models, but the whole apparatus by which the William is to be brought up. The William was run down by one of the foreign steamers last winter—she was 400 tons burden, and not being considered worth raising, was abandoned by her owners, and became a ruinous impediment to the navigation. The Lord Mayor, as conservator of the Thames, put out notices for tenders for the removal of the wreck, and Mr. Kemp's plan was accepted, his offer being 500*l.* A large schooner was brought to the spot, containing 32 cylindrical vessels each six feet high, by four and a half diameter, lined through with zinc, and having only one head. Across the opening is a strong iron, which is firmly attached to the machine, with a hook in the centre. The first step resorted to was to ascertain the precise situation of the vessel. This was done by means of Dean's diving apparatus, which merely consists of a copper helmet, with a glas front, supplied with air from a pump in the vessel above. The divers then proceeded to pass entirely round the vessel from head to stern a chain cable of tremendous strength. To this at intervening distances of six feet is attached short bridle chains; and to the end of each of these is a rope with a buoy attached to it, which floats on the surface. When everything below is complete, this rope is passed through the eye at the open end of the cone. The cone is then cast overboard and immediately fills with water, and descends exactly to the bridle chain. The diver then goes down and secures the two together. As soon as a sufficient number are attached, a tube connected with the air pump is placed under the open end; and the air is then forced from the pump into the cone, and as soon as it leaves the tube, rises naturally inside the vessel and displaces the water by taking its place at the upper end. The cylinders are filled in this manner by degrees, taking the alternate sides of the head and stern first. Water being a non-elastic fluid, will naturally cause a body that may be sunk to rise to the surface as soon as it shall be made lighter by the elastic fluid confined in the cylinders. Therefore it is quite clear that any body must be raised if only sufficient air is attached to it, and this was the case in the experiment tried on a small vessel loaded with iron we had the pleasure of witnessing, and which it was the opinion of every person present must raise the William, it were not for the numerous impediments and obstructions that have been thrown in the way. The vessel lying in mid-channel is being continually run over by other vessels; and several times the iron chain round the bottom of the wreck has been carried away by the anchors of colliers and others getting foul of it. The buoys attached to the bridle chains have been over and over again destroyed by the paddle-wheels of the steamers, whose masters really appear bent on doing the machinery as much injury as possible. Two of the large cylinders were last week carried completely away, and have not since been found. The Lord Mayor has sent down a lighter, which is moored, to warn vessels from the spot, and the city flag is hoisted on board Mr. Kemp's schooner; fires are also kept burning the whole of the night; even this is to no purpose, for on Sunday afternoon last, just as every thing was prepared for weighing, down came a collier, damaged the schooner to the amount of 200*l.*, and carried away a large number of tanks. It is evident, unless some better protection is afforded Mr. Kemp, he must abandon this ingenious plan, at considerable loss to himself, and the almost total destruction of his property. The working model exhibited is that of a vessel about three feet long, loaded with iron, which was raised to the top of the water in the tank with the greatest possible ease, as was also a large lump of iron, and every person present seemed perfectly satisfied that this plan must succeed in deep water, where every other method would fail.—*Gravesend Journal.*

Rendering Thatch incombustible.—A. M. G. Barentin of Leipsic lately invented a method of preparing thatched roofs in such a manner as not to be liable to danger from fire. The Saxon government has had M. Barentin's thatch tried, and has approved of it so much as to order it to be generally made use of. (*Scotsman.* Sept. 20, 1837.) Alum would have some effect, both in preserving thatch, and in rendering it incombustible. We know an instance of a gentleman Kyanising the thatch to be used on an ornamental cottage roof, and we hope to be able in a few years to state the result. In the mean time we should be glad to learn if any of our readers know the German secret; and whether any have tried Kyanising with thatch, and what has been the expense per superficial yard of thatched roof, or per truss or load of thatch.—*Architectural Magazine for September.*

Symington's and Howard's Systems of Condensation.—We have received a communication from Mr. Howard, claiming Mr. Symington's method of condensation by injection as an infringement upon his patent. We think the subject has been sufficiently discussed in our twenty fifth and twenty sixth volumes, to enable our readers to form their own opinions upon the subject. We are willing to do full justice to both parties, and therefore, having inserted a description and engravings of Mr. Symington's invention, we shall be happy to do the same for Mr. Haward, if he will supply us therewith.

Errata,—In the description of "Griffin's Electrometer," No. 721, p. 134, 1st col. line 2 from bottom, for "discharge" read "charge." 2d col., ll. 13 and 17, for "emitted" read "emittent," l. 42, for "constant" read "emittent," l. 48, before "best" insert "be"; p. 135, l. 9, dele "one," l. 30, for "emitted," read "emittent."

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MUSEUM, REGISTER, JOURNAL, AND GAZETTE.

No. 744.] SATURDAY, NOVEMBER 11, 1837. [Price 3*d.*

MACKENZIE'S BUOYANT PADDLE-WHEEL.

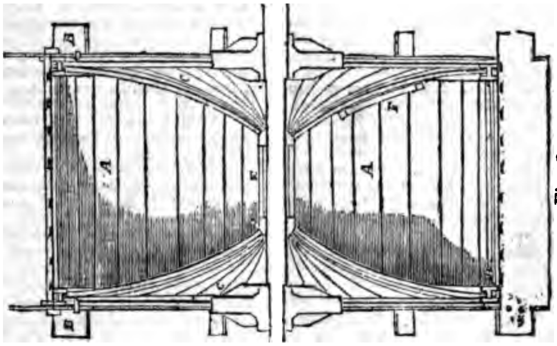


Fig. 2.

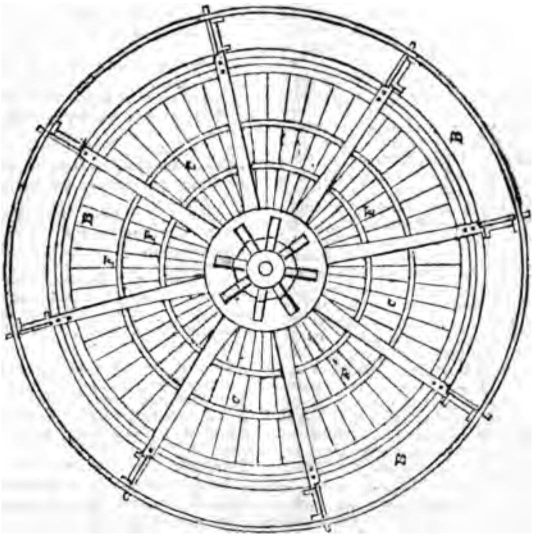


Fig. 1.

MACKENZIE'S BUOYANT PADDLE-WHEEL.

Sir,—Will you allow me to offer to the public, through the medium of the *Mechanics' Magazine* the following suggestion, intended for the improvement of the common paddle-wheel of steam vessels? It is, to have the whole central portion of the wheel within the inner edges of the float boards, closed up watertight all round, so as to make it buoyant. It would thus by its position, being so far removed sideways from the centre of gravity of the vessel, contribute that buoyancy towards *checking* the rolling motion of the vessel: while at present the paddle-wheel must exert its weight, with corresponding effect in *continuing* such rolling motion.

Moreover, might it not be advisable to construct the wheel, so that not only during a heavy roll of the vessel, but also when moving along steadily, the buoyant portion should be sufficiently immersed to support the weight of the wheel in the water, and thus, besides relieving the hull from that burden, take off so much of the friction as thence arises, from the axis in its bearings? This is presuming that the action of the float boards in beating down the water underfoot as they enter it obliquely, would prevent its opposing so great a resistance as otherwise it might, to the onward progress of the buoyant part of the wheel.

In regard to the construction of the water-tight casing, I presume that the circular form would give great facilities for the combination of strength with lightness. In the annexed diagrams, fig. 1 a side elevation, and fig. 2 a transverse section in respect to the vessel, or longitudinally through the axis of the paddle-wheel,) the convex surface between the float boards is supposed to be formed of a succession of planks A A, placed transversely and notched near their ends, upon flanges projecting from circular iron rims B B, whereon they all rest; and then hooped round like a cask: only of course the hoops must be tightened *after* they are on (though before the float boards are put on.)

The sides of the buoyant casing I have supposed to be made of thick planks C C, converging towards the middle of the wheel, but each bulging out from the general line of its direction in order to resist the pressure of the water. These converging pieces might first be introduced with their inner or narrowest ends foremost, and when they are got quite within the framework of the wheel, their heels might be stepped into grooves, facing inwards, in the iron rims beforementioned B B. Then their narrow ends might be brought to abut against two wooden hoops, D D, which closely embrace the axis; and then the whole might be secured by jamming the short straight pieces, E E, between the two hoops, so as to force them as far as possible asunder. In this mode of construction the planks, C C, could not be grooved together to prevent leakage, but they might be rebated; and to assist in preventing a sliding motion of one against another at the edges, I have supposed iron hoops, F F, to be nailed concentrically over them. At F is a kind of port hole by which to get at the inside. The whole might be caulked, and perhaps coppered on the outside.

I am, Sir,
Your obedient humble servant,
GEORGE MACKENZIE.
Architectural Draughtsman.

3, Claremount Row, Islington,
Oct. 24, 1837.

ON THE NATURE OF ELECTRICITY—ITS MOMENTUM.

Sir,—Having in my last letter, with a view to the establishment of the materiality of electricity, suggested an experiment to ascertain, in the first place, whether it possess the quality of gravity, to which materiality is essential, I now propose to enquire with the same view, secondly, whether it possess momentum. That it does, I think is strongly evidenced by many recorded experiments. The common experiment of a discharge through a chain, when carefully observed, especially between one pair of links at a time, has the appearance of several spirts, some longer and some shorter, just as one would expect from a current of fluid matter dashing against a solid lying in its course, or against another current coming in a different direction. Each spirt at the same time has the appearance of a snail's horn, as though the extremity of it were formed into a small ball by homogeneous attrac-

tion at the moment of its losing its projectile force or momentum, and beginning to fall back into the stream from which it was dashed out. Where considerable quantities of electricity have been used, I have seen the spirts take the form of vapour or spray. Several of Priestley's accidents in bursting jars are, I think, not only explicable on the supposition of momentum, but go to prove it almost beyond a doubt. Some quotations from his work on Electricity, 3rd edition, vol. ii, page 240, *et seq.*, part 8, sec. 7, will best show the facts.

Quot. 1. "I am confident that several of my jars have burst with much less charge than they had actually held before."

Quot. 2. "A jar of an ordinary size which had been in constant use for several months, and which had discharged itself more than a hundred times without any injury, at length burst as I was discharging it at the prime conductor. The whole was at a different place from that at which the discharge was made, but this does not always happen. The tip of my little finger happened to lie very lightly on the place, and I felt it was burst by a small pricking as of a pin, though the explosion at the conductor was nearly equal to that of any other discharge. The coating of a jar contiguous to one that is burst is always melted by the explosion."

A very similar accident to this of Priestley's happened to a jar of my own which was made of a wine bottle, rather larger than ordinary, and which had hundreds of times borne a very strong charge, but at last burst at the instant of discharging it, while standing on the table in connection with the prime conductor. The report was very much louder than I had ever heard it, and appeared to come from the usual discharge by the discharging rod. The unchangeable nature of glass seems to prove that some greater power must be in operation at the point where it gives way than there ever had been before. This does not seem possible to have been the case where the electricity was quiescent, and in less quantity, as Priestley affirms, than it had been in former cases; we must therefore look to the motion of the lesser quantity of electricity for the production of these more powerful effects, which a greater quantity in a *quiescent state failed* to produce. These effects seem only producable by increasing the intensity of this smaller quantity of electricity at those places where the effect is to be produced; and this increase can only be by a decrease at some other point. What is this but the ordinary case of a wave? But how to produce this wave? The first means of producing it applies to the foregoing cases, and I suppose it to be this. The approach of the knob of the discharging rod solicits the electricity, both from the jar and principal conductor, each giving a much larger current than the dischaging rod is capable of receiving. There is, consequently, raised by the concussion of these currents a great heap or accumulation (*i. e.* intensity) of electricity. Returning waves are thereupon sent back by this heap to the extremity of both the prime conductor and the jar. The extremity of the latter is at the top of its inner coating, at, or near which, my jars have generally burst. There the currents from all parts of the jar meet, and being refused a passage by the uncoated glass, tend by their momentum, and their concussion with each other to rise up in a heap and create a greater intensity than the jar had ever been capable of receiving by a gentle flow and equable accumulation of electricity. This idea, that bursting arises from a local and temporary increase of intensity, is remarkably strengthened by the fact in these cases, that there was a discharge in the usual way at the same time that the jars burst, and in the case of my own jar, that the ordinary discharge produced a much louder report than it ever had done before, although a portion of the fluid must have passed by the extraordinary discharge through the fracture. The point of the finger (quot. 2) touching where the jar burst, makes it seem very probable that it furnished a ready path for the electricity from the outer coating, so as to form there a stronger negative, and favour the formation of a positive heap or wave on the inner coating. I had a similar case or two happen to myself. The burnt coating of the adjoining jar (quot. 1) seems to have answered the same purpose. The foregoing views are still further confirmed by other experiments of Priestley's, where six or seven jars were all burst at once, and some even in seven or eight places; and he thus alludes to a battery

of forty jars, one square foot of surface each, discharging itself.

Quot. 3. "Six of the jars were burst; one had the tinfoil coating on the outside quite melted in a circular spot, about half an inch in diameter, and in the inside it was burned quite black near an inch and a half; a second was melted on the outside about three quarters of an inch in diameter, and the black spot in the inside was two inches; a third had one hole made in the form of star, more small cracks, like radii proceeding from a centre, than could be counted. And there was hardly one of the jars that was burst with a single hole. Some were burst in seven or eight places, of which some were very remote from others; but generally there was one principal hole, and several smaller, but independent ones in the neighbourhood of it, as within half an inch, an inch, or two inches from it."

These smaller holes are a very remarkable confirmation of currents meeting and producing heaps. The whole heap not finding an immediate passage at the principal hole, commences its retreat, and falling back on other portions of the several currents just arriving with all their momentum, other heaps are formed, each of smaller quantities than of the principal heap, but of an intensity greater than existed in any part of the battery in a quiescent state.

The melting of the tinfoil and burning it in one case even over two inches, seem not to require any suggestion of the extraordinary intensity of the electricity that must at least momentarily have existed there. How could a similar intensity be produced by any other means than those contended for. Priestley says, that on discharging two batteries, containing together 63 square feet, one jar was broken in each, and that (quot. 4), "both batteries had frequently borne a much higher charge. When jars disposed in batteries have been burst in this manner, I have never failed to observe one circumstance which appears to me truly remarkable. It is, that though in this case several passages be opened for restoring the equilibrium of the electrical fluid, yet the whole seems to pass in the current that is formed for it externally. At least the effect of the explosion is not sensibly diminished upon *any substances that* are exposed to it. This I had a fair opportunity of observing when I was transmitting the explosion of the battery through wires of different metals. I found that the utmost force of the battery would do little more than melt a piece of silver wire on which I was trying it, and yet it was at one time totally dispersed by an explosion in making which three jars were broken in different parts of the battery."

Priestley says, the whole seems to pass, and says so, because its effects are not less in the ordinary circuit. If quantity is the cause of these effects, why is it not necessary also to produce the perforation of the glass? Quantity seems to have nothing to do with it, only so far as it ministers to the increase of the intensity. I have so far only attempted to account for the bursting of jars when being discharged. I shall now endeavour to account for the same thing happening spontaneously, and at the same time combat an idea of Priestley's on that head. He says (quot. 5), "a variety of experiments seems to show, that while a jar continues charged, the electric matter is continually insinuating itself farther and farther into the substance of the glass, so that the hazard of its bursting is the greatest some time after the charging is over." He then says, he had left a battery charged a minute and a half, when it discharged itself, and one of the jars at a distance from where he saw the flash at the wires, burst in two places." If the reason given by Priestley (the electricity insinuating itself into the pores) were the true and only cause of bursting, then the glass at all the perforations ought to be of exactly the same strength, so as to give way at the very same instant of time; for if otherwise, on one perforation taking place (however small) the whole electricity would almost instantaneously pass through it. That this wonderful equality of power should have existed in the (probably) twenty or thirty places where perforation took place (in quot. 3) seems quite an incredible coincidence. We must, therefore, seek for the true explication in some cause capable of causing the electricity to perforate a strong part of the glass at the same time that it perforates a weaker. That cause is, current — undulation — momentum. The way I suppose it to have arisen in quot. 5, is, that the electricity overcoming by degrees, the non-conducting

power of the glass where the flash took place, began spontaneously to discharge the battery, creating a current from all parts in that direction. Their momentum bringing the electricity in greater quantities than the passage opened for it was capable of receiving (as in the case of the discharging rod before explained) there would be a returning wave, and its consequences, as in that case. But there are, I believe, jars burst when there is no discharge from the mouth of the jar. All the edges of the internal coating may be considered as the borders of a reservoir of fluid. Water in a reservoir, and level with the banks, if it find a vent into any smaller receptacle near it, is immediately drawn towards that point from all other points, till by its momentum it raises its surface in the smaller reservoir and round the vent, higher than in any other part. There is, consequently, a returning wave, which, going back in all directions, may be able (by the small additional force it gives to the water in any other parts of the reservoir) to find other vents there, also creating other currents, and returning waves, so as to create a general commotion, and a rising of the water in high waves in many places, both at the banks and elsewhere.

This, I suppose, to be very like the effects of an accumulation of electricity, which, at the edges of the positive coating, gradually progressess over the uncoated glass, and sometimes meeting with a readier passage, a quantity is carried suddenly from the coating to some part beyond it, but not far enough to come within reach of the negative coating. This sudden abstraction from the main quantity, like the water finding a vent, immediately causes a current from every quarter to fill up the void left. The momentum accumulates a heap, which causes returning waves to other parts, where portions of electricity, assisted by the momentum of the currents, find passages over portions of the uncoated glass. These again occasion similar currents, and, as in the case of water, cause waves and heaps of the fluid (which are only other names for high intensity), in many parts of the battery, and that at the same instant of time, so as to produce the simultaneous perforations mentioned in the above quotations.

Priestley had a jar one-eighth of an inch thick (which never held but a moderate charge) burst spontaneously. There was a principal hole, and at a distance from it, and from each other, two others barely visible, one being above the external, but not above the internal coating.

The thickness of this jar, and the smallness of its usual charge, strongly confirm the foregoing views; and the extreme minuteness of the two smaller holes are almost convincing proof of the smallness of the quantity of the electricity by which they were made.

CORPUSCULUM.

Oct. 17, 1837.

IMPROVEMENT IN MOORING BALLOONS.

Sir,—I take the liberty of referring Mr. Edward G. Hitchings, whose improved method of mooring balloons appears at page 40 of your last number, to page 40 of your *tenth volume*, where he will find I proposed to effect the *perpendicular descent* of balloons after the grappling iron had caught hold of the earth, by taking an elevated point of attachment. In a conversation with Mr. F. Gye, a short time since, he informed me that this precaution was now always adopted, so that fig. 1, page 41, does not "represent the present plan of mooring a balloon."

Mr. Hitching's method of using the elastic rope, as well as the attaching pulley, is a suggestion that may be advantageously employed, but he will perceive that he has, in some points at least, been forestalled, nearly ten years, by

Yours respectfully,

WM. BADDELEY.

Oct. 22nd, 1837.

STATISTICS OF THE BRITISH ASSOCIATION—RESULTS OF MACHINERY.

Sir,—The proceedings of the Liverpool Meeting of the "British Association for the Advancement of Science," of which you are favouring your readers with a very ample report, are certainly, however valuable in some respects, exceedingly open to objection in others. The facetious "Boz" has already raised the loud laugh at some of those points

which seemed most invitingly within the scope of ridicule, and in no case has he been more happy than in his "taking off" the proceedings of the Statistical Section. The same section appears also more obnoxious to serious stricture than any of the rest, as the following brief remarks on that portion of the report of their labours which appeared in the last number of the *Mechanics' Magazine*, will perhaps be sufficient to testify :—

Mr. Ashworth, of Bolton, the most active member of the body, we are informed, laid before the section a paper on the "Origin, Procedures, and Results of the state of the Preston Cotton-Spinners in 1836-7," from which an estimate of the "pecuniary loss" caused by that movement, is extracted by way of specimen. Now this "estimate" proceeds on an egregious fallacy, which an eminent statistician, of all people in the world might well be expected to steer clear of. The amount of loss is swelled to upwards of 100,000*l.*, by taking into calculation, not only the direct loss in wages to the weavers, not only the loss to the masters of interest on their capital, but also the indirect loss sustained by the shopkeepers, from "loss of business, bad debts, &c. Upon this principle, the amount of loss might have been increased to any extent. *Why stop at the shopkeepers?* If they could not sell their usual quantity of goods, the wholesale dealers who supplied them must have suffered a "loss" of their usual profits; the merchants who supplied the wholeale dealers must have submitted to the "loss" of *their* profits on the goods which would have been sold, and so on, *ad infinitum.* Why were not all these losses duly estimated and registered; or why stop even there? Why not suppose that all parties sharing in the calamity felt the necessity of "cutting heir coat according to their cloth," and forthwith make a proper allowance for the "loss" undergone by the butchers, bakers, tailors, shoemakers, &c. of the parties interested,—not only the tradesmen of Preston, but those of the wholesale dealer and the merchant, to say nothing of the merchant's clerks, the ship-captain also would have imorted the goods, and as many more as he imagination can conjure up, in never-ending series? Unless all this be done, *he calculation,* on the very principle adopted by its author, is manifestly imperfect. A statistician of his order should be gifted with the imagination of Alnaschar, in the Arabian Nights, who, when he kicked over his basket of crockery, saw the *prospective* wealth of the imperial treasury destroyed at a blow!

But why is it that, in cases where working men and their efforts to better their condition are concerned, it is always thought fitting to resort to such exaggerations? Why is the "operative" when a *strike* is determined on, to be denied the consoling reflections which are so plentifully supplied to him when the masters stop working? It is strange, indeed, that when he chooses, for his own purposes, to "keep out of the labour market" for a time, he is expected to forget all he has ever heard of the great advantages that result from such a procedure, and see nothing but the enormity of his crime in taking the political economists for once at their word! The passages, which follow Mr. Ashworth's calculations are exceedingly striking in this point of view.

Every body knows that the Useful Knowledge Society, and all the school of economists, to which the members of the "statistical section" belong, are never weary, when occasion serves, of proving to the "ignorantly-impatient" mechanic that the "result of machinery" is to better his condition. They are not contented with the admission that this must eventually be the case, but are satisfied with nothing short of arguing that it is to the labourer's advantage that machinery should be introduced as quickly as possible,—or even that its rapid introduction should be encouraged as a peculiar blessing to the working classes! But the "case is altered" when the working classes are concerned in procuring its adoption. In consequence of the strike, it seems, the self-acting mule has been introduced at Preston. On this Mr. Felkin observes that, "this was another example of the *mischief* which the workmen *bring upon themselves.*" The "mischief!" Why, if the self-acting mule had been brought into action by the cupidity of the master-manufacturers instead of the ignorant impatience of the workmen, Mr. Felkin, with the whole statistical section at his back, would never have been weary of expressing his astonishment at the hostility of

the "operatives" to machinery,—of kindly showing them how ridiculous were their errors as to its being hurtful to their welfare,—and, (in case some of them had endeavoured to get rid of the "mischief") of invoking the vengeance of the law on those "misguided men" who had actually set about destroying their "*best friend!*"

Can it be that the players of these "fantastic tricks" are unable to perceive their own inconsistency, or do they entertain so contemptible an opinion of the intellect of the working man, that they think *he* cannot detect it? If so, they happen to labour under a pretty considerable mistake.

I am, Sir,
Your very obedient servant,
H.

London, Nov 1, 1837.

RIVAL FIRE-ESCAPE INVENTORS.

Sir,—The exceedingly lame apology on behalf of the Humane Society set up by K. I. W. at page 39, as well as the attempted defence of Mr. Wivell, contains but one point not already set at rest by my previous communication. I refer to the assertion, "that Mr. Wivell has had no chance of competing, except when Mr. Ford *privately* exhibited in the work-house yard, Poland-street, Mr. Wivell did, *publicly* in that neighbourhood; and who," says K. I. W., "can boldly come forth, and say, that public opinion was not then with Mr. Wivell?" I hardly know what "public opinion" consists of in K. I. W.'s peculiar views; if the joyous shouts of the delighted urchins on emerging from the canvas tunnel, or the roars of laughter of the bystanders at the drollery and fun of the exhibition, constitutes "public opinion," then it might be said to be with Mr. Wivell! But, if the choice made by the guardians of St. James', after witnessing the action of both machines, may with more justice be taken as some demonstration of public opinion, then most assuredly it was *not* with Mr. Wivell! the guardians having selected and adopted the fire-escape of Mr. Ford!

K, I. W. puts the word "privately" in italics, I may just observe, that the exhibition was as public as a liberal distribution of printed hand-bills some days previously could make it, and all comers were admitted to the place of exhibition.

The remainder of K. I. W.'s special pleading is fully answered by the facts advanced in my communication at page 3.

I remain, Sir,
Yours respectfully,
WM. BADDELEY.

Oct. 22nd, 1837.

THE RIVAL FIRE ESCAPE INVENTORS.

Sir,—From an aversion to unnecessary publicity, I have hitherto observed in silence, but now feel compelled to notice, the frequent use, or rather abuse, of my name in your Magazine. No less than ten numbers have made public, within the last few months, articles touching my interest, without hitherto one word from me; I trust you will now allow me an honest defence.

K. I. W. has stated that my "Fire Escapes" were supplied to Liverpool, the London parishes, and the Royal palaces, through "private interference." The facts are as follows:—

The Commissioners who formed the Liverpool Fire Police, advertised for fire escapes. London and other places obeyed the call. The canvass spout, which the author of the "Paragon" has adopted, was there represented by a Mr. Wesley. The result of the competition was as follows:—

"The Committee had inquired into the subject of fire escapes, and they recommended the Board to order two of Mr. Ford, whose invention was at once simple, ingenious, and effective." &c.

"*Liverpool Chronicle*, April 5, 1834,

"The sum of £30 was awarded to Mr. Ford, for two Fire Escapes; the invention is most simple, portable, and capable of instant application."

"*Liverpool Journal*, July 5, 1834.

When the Committee of St. Pancras Association advertised for fire escapes, I believe I was the last of fifty that presented a model.

"At a meeting of the Committee of Management of the Association for providing a fire engine and fire escapes for the above district of St. Pancras, held at the Fitzroy Coffee House, on Tuesday the 23rd of February, 1836. 'It was resolved unanimously, that the Committee have no hesitation in expressing their perfect conviction of the utility and benefit of Mr. Ford's plan

of a fire escape (which they have adopted), and they consider their application throughout the metropolis, highly desirable.

"John Newbury, Jun. Chairman,
(signed) "Alfred W. Waugh, Treasurer,
"Au. Theselton, Secretary."

On the 8th of June following it was also resolved:—"That the sum of five pounds be granted to Mr. Ford (independently of the payment for three fire escapes,) to mark the sense which the Committee entertain of the benefit likely to accrue to this neighbourhood in the event of fires, by the application of his plan of a fire escape."

As to the Poland-street affair; I was sent for by the guardians of the parish of St. James, and requested, after explaining my model, to exhibit an escape on the large scale. I objected on account of ill health and expense; when the objection was overruled by an assurance that it was with the view to giving me an order, that the experiment was required. I then complied, and Mr. Wivell had the peculiar modesty to rush uncalled, to my appointed province, with his "Paragon;" of course he was refused admittance into the parish ground; but he exhibited without the walls; and the parish authorities honored *him* with a *gaze*, and *me* with an order for *three escapes*.

At the Lowther Rooms, at the early part of the operations of the "Society," Mr. Wivell gave full scope to his own praises, whilst I remained silent. How came it to pass, then, that I received an order for *three escapes*, and Mr. Wivell *none*, if the "Paragon" was the *favourite?* It is true that Mr. Wivell did (I think prior to that) supply a "Rope Escape"; but where is it?—Pronounced by that very Committee, useless!

As to "private interference" touching the supply to the palaces, I rest content in the judgment of many of the leading scientific men in the kingdom. The late king, be it remembered, at my *personal interview*, confirmed the judgment of his own Board of Works.

As to the statement that it was "Ford's Fire Escape" that was placed wrong way upwards in the Strand: my escape was not conveyed to the spot till after the sufferers were destroyed; and after also the firemen had tried their ladders, and were beaten off.

Nothing short of a legislative measure is likely to be efficient for the protection of the inhabitants of this vast metropolis from fire; unless some ten thousand volunteers were enrolled in imitation of the American system.

It is a singular contrast, that while Mr. Wivell has been six or seven years inventing, or rather *arranging* a fire escape, perhaps to his ruin; my escape, eleven of which are in the Royal palaces, and which led me into the Royal presence, was contrived, and executed with a penknife, one winter's evening!

Sorry that the taunts of opponents should have forced me to trespass, once for all, on your indulgence,

I am, Sir,

Yours most respectfully,

W. FORD.*

HALL'S OBLIQUE-FLOAT PADDLES—CORNISH STEAM ENGINE DUTY.

Sir,—I have seen in your No. 739, an account of a paddle wheel with *oblique paddles*, which is called new. I beg leave to say, that Mr. Dickson made and used wheels *precisely the same* as this, more than a dozen years ago, with the addition of rims, the same width as the paddles, which are absolutely necessary to render them efficient propellers: without the wide rims, one half the paddles dash the water against the sides of the vessel. A model of this wheel is to be seen at the Society of Arts, for which Mr. Dickson was horoured with a medal particularly for a useful contrivance of raising and lowering such wheels *even* while in motion. This is the same Mr. Dickson who has lately had the controversy with the Cornish engineers, in your Journal, and who has so incontrovertably exposed their errors. By the bye, where is their champion, Mr. Enys? He ought to be preparing for the practical proof desired by Mr. D., which he, Mr. Enys said, "they would in no way shrink from ascertaining." I have also seen Mr. Dickson's name amongst the list of patents in your No. 742, for improvements in steam engines and in generat-

* We have been compelled to omit a considerable portion of Mr. Ford's letter, containing expressions of anger, which it would be impossible for us to publish. Our correspondents, and particularly Mr. Baddeley, we feel assured will agree with us in saying, that this correspondence has gone to sufficient length to enable our readers to form a correct judgment between the contending parties. Here the controversy must drop. ED. M. M.

ing steam. I know Mr. D. has for many years been maturing such improvements, and I understand the result is the reduction of about 25 per cent. in the consumption of fuel, without increasing the first price, or risk, this achievement comes in time to render the passage to America by steam, not only *possible*, but *profitable*; however, we cannot know the particulars of this invention before May next, without applying to the patentee himself.

Yours,

P. E.

October 30, 1837.

THE NEW GOVERNMENT STEAMER "GORGON."

The new steamer "Gorgon," now lying in Woolwich Basin, is the largest steamer in her Majesty's service; she is of 1150 tons, builders measurement,—37 feet 6 inches beam; and her depth of hold 22 ft. 9 in. She has sponsons on each side, which make the deck 10 ft. more, say 47 ft. 6 in.; length between perpendiculars, 179 ft.; over all 210 feet. She will carry a tier of 36-pounders on her main deck, and two large 84-pounders. At each end on the upper deck there are swivel guns that will range 290° round the horizon. The vessel is constructed from the designs of Sir William Symonds, Surveyor of the Navy, and is, without exception, as regards her build and form, the finest steamer afloat. She will carry twenty days coals,—1000 troops; 136 crew; and stores and provisions for all, for six months. The engines, which are of 320 horse power, are now making by Messrs. Seaward and Co., with their patent slide valves, now coming into such general use on board of steam vessels. The cylinders are 64 inches in diameter; wheels 26 feet; boilers all of copper, and the coal-boxes in the engine-room will contain 360 tons of coal. The boilers, cylinders, and all the vulnerable parts of the engine will be 4 feet under the water line, besides having on each side from end to end of the engine room, a depth of coals in the boxes 7 feet thick. The whole of the steam machinery, may be said to be invulnerable from shot.

ENCOURAGEMENT GIVEN TO RAILWAYS IN FOREIGN COUNTRIES.

(From the *Railway Times*.)

The legislature of New York, by Act of 23rd April, 1836, authorised the issue to the New York and Erie Railroad Company of *three millions* of the public stock of the State, *irredeemable* for twenty years.

The proprietors of the land required for the first forty miles of the same railroad, gave it almost unanimously for nothing. The pecuniary value of this liberal gift was estimated to exceed two millions of dollars. (How different the conduct of British landowners!)

The city of Baltimore invested in a corporation in the Baltimore and Ohio Railway, three millions and a half of dollars.

The city of Louisville subscribed two hundred thousand dollars to the Lexington and Ohio Railroad.

The Emperor Nicholas (though a tyrant, no fool) has conceded to the company for the formation of the Zarskoe Selo Railway (between Petersburgh and Pawlowsky) greater privileges and advantages than were ever before granted to any similar undertaking in any country. Pleased with the boldness of this attempt to introduce into the Russian empire, in spite of its frosts and snows, this novel system of communication, and deeply impressed with the advantages which it will confer on his sixty-five millions of subjects, he has made, in this instance, his despotic power as omnipotent for good, as in other instances for evil. The batteries in the Artillery Ground, and the Congreve Rocket Manufactory, happened to stand in the way of its taking a perfectly straight course; at the imperial mandate they were levelled with the ground. Several of the crown tenants were among the occupiers whose lands were required; they were ordered forthwith to remove to other lands, and compensated for whatever losses they sustained by the transfer. His Majesty's own rights, as lord of the soil, he everywhere surrendered for nothing. The Company, too, were empowered to import English rails and English engines, duty free. And, to crown all, they are authorized to charge whatever tolls they please, and the railway is to remain their property for ever!

PROCEEDINGS OF THE LIVERPOOL MEETING (BEING THE SEVENTH) OF THE BRITISH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

President—EARL OF BURLINGTON.

September 11—16, 1837.

(Select notices, extracted and abridged from the Athenæum).

(*Concluded from* p. 79).

SECTION A.—MATHEMATICAL AND PHYSICAL SCIENCE.—FIFTH SITTING.

Mr. Lubbock made a communication on M. Poisson's Theory of the Constitution of the Atmosphere.

Professor Phillips presented a Report of the Proceedings of the Meteorological Committtee during the past year. It appeared that the general truth of the regular augmentation of temperature was confirmed, but that, in addition, the different distribution of water, the nature of the rocks, and other causes, produced local discordances. The last of these causes appeared to the Committee of such importance, not only for the explanation of these differences, but for purposes of general reasoning in physics, that Professor Forbes was requested to institute a complete series of continuous experiments, similar in general principle, and at corresponding depths below the surface of the ground, as those established by M. Quetelet, at Brussels, so as to determine the *rate* of communication of heat, *in one uniform mass*, from the surface down to the depth of 26 feet; and further, to ascertain the *differences of this rate in materials of different kinds*, by a triplicate course of observations in trap-rock, sandstone, and a uniform mass of sand.

The sun's heat was found to extend to variable depths at various places, and with many alternations of increase and diminution; and it was in general necessary to descend from one to two hundred feet before the effect of this cause disappeared: from thence downwards, the evidence of an increasing temperature seemed to be quite satisfactory. At a colliery at Wigan, where the surface mean temperature was 50°, at 50 yards deep the temperature was constantly 53°; at 150 yards deep, the temperature was 56°.75; at 250 yards, 63°. From this set of observations, it appeared that a descent of 100 yards was accompanied by an increase of temperature of about 6°.25, or about one degree for 16 yards; the result of the observations made in France giving one degree for about each 15 yards of descent.

A Report was read on the Magnetical Survey of Great Britain.

Dr. Robinson made some observations on Parallax.

Sir W. Hamilton made some observations on new applications of the Calculus of Principal Relations.

Sir William gave a sketch of some new applications which he had made, and of others which he hoped to make hereafter of his calculus of principal relations. The object of that calculus was in general to integrate the differential equations to which the calculus of variations conducts.

Sir D. Brewster read a notice of a new structure in the Diamond. He said, that having communicated to the Geological Society an account of certain peculiarities in the structure of the diamond, which confirm the theory of its vegetable origin, he was desirous of submitting to the consideration of this Section a new structure which he had recently detected in that gem, and which indirectly supported the same views. In consequence of the diamond having been used as the fittest substance for forming single microscopes of high power and small spherical aberration, the attention of opticians has been drawn to the imperfections of its structure. Mr. Pritchard, who first succeeded in executing lenses of diamond, put into the hands of Sir David for examination, a plano-convex lens about the 30th of an inch in diameter, which he had found unfit for the purposes of a microscope in consequence of its giving double images of minute objects. As Sir David had previously shown that almost all diamonds possessed an imperfect doubly refracting structure, as if they had been aggregated by irregular forces, compressed or kneaded together like a piece of soft gum or an indurated jelly, he had no doubt that the double images were owing to this structure, as there appeared, on an ordinary examination of the lens, to be no other cause to which it could be reasonably ascribed. This was also Mr. Pritchard's opinion, and the existence of such images prevented opticians from rashly cutting up diamonds which might turn out useless for optical purposes. As lenses of sapphire and ruby, which Sir David had long had occasion to use in very delicate microscopical observations, produced no duplication of the image, although the rays passed in directions in which the double refraction was much greater than in any specimen of diamond which he had examined, it occurred to him that the double images might arise from some other cause. He therefore proceeded to examine the light transmitted through the diamond by combining it with a concave lens of the same

focal length, in order to make the rays pass in parallel directions through its substance. This experiment indicated no peculiarity of structure at all capable of producing a separation of the images, and he was therefore led to examine the plane surface of the lens by reflecting from it a narrow line of light admitted into a dark room, and examining the surface with a half-inch lens. While turning round the plane surface of the diamond, he was surprised to observe the whole of its surface covered with parallel lines or veins, some of which reflected the light more powerfully than others, so as to have the appearance of a striped riband; a space of less than *one-thirtieth* of an inch contains many hundred veins or strata of different reflective and refractive powers, as if they had been subjected to variable pressures, or deposited under the influence of forces of aggregation of variable intensity. If, Sir David observed, the planes of these different strata had been perpendicular to the axis of the diamond lens, their difference of refractive power would produce no sensible effect injurious to the perfection of the image; but if these strata are parallel to that axis, as they are in the lens under consideration, each stratum must have a different focus, and consequently produce a series of partially overlapping images.

The results of this experiment in restoring the diamond to its value as an optical material, in so far as it enables us to cut it in a proper direction and select proper specimens, and its connexion with some delicate researches of Professors Airy and Maccullagh on the superficial action of diamond upon polarized light, possess considerable interest, but the fact of a mineral body consisting of layers of different refractive powers, and consequently different degrees of hardness and specific gravity, is remarkable. There were several minerals, such as *Apophyllite*, *Chabasie*, and others in which Sir David said that he had found different degrees of extraordinary refraction in different parts of the crystal; but this variation of property depends upon a secondary law of structure; and he believed that there was no crystal, either natural or artificial, in which the properties of ordinary refraction, hardness, and and specific gravity, varied throughout its mass. This peculiarity of structure, therefore, might be regarded as an indication of a peculiarity of origin: and as there are various strong arguments in favour of the opinion that the diamond is a vegetable substance, the new structure which he had described might be regarded as an additional argument in favour of that opinion. He had, in a former paper, placed it beyond a doubt that the diamond must have been in a *soft state*, like amber or *gum, and capable of having its structure* modified by the expansive force of air or gaseous bodies imprisoned in its cavities; and therefore the fact of its being sometimes composed of strata of different degrees of induration and refractive power, was more likely to have been produced by pressures varying during the formation of the crystal, than by any change in the intensity of the forces of aggregation of its molecules. Such a change might have been supposed probable had it been found in another crystal. He had already referred to the action which diamond exerts superficially upon light. Professors Airy and Maccullagh have found that this action is of very peculiar kind, having some analogy with that of metallic surfaces; but it was obvious, from the preceding facts, that a surface of various refractive powers must disturb, in a very considerable degree, the phænomena produced by its superficial action. In studying, indeed, this class of phænomena, it would be necessary not only to obtain a surface of uniform structure, but to make the experiments before that surface had experienced any change from the action of the atmosphere. In surfaces of glass, such changes often take place in a few days; and the thin films of oxide which are thus created, are so thin that they can only be rendered visible by examining the light reflected from the surface when it is placed in contact with an *oil* or *liquid* of the same refractive power.

Professors Stevelly and Powell read an account of experiments relative to the influence of surfaces on the Radiation of Heat.

The object of this communication was to call the attention of the Section to the researches of Professor Bache, of Pennsylvania. In contending for the necessity of equalizing the coatings compared, in other respects, before we can estimate the effects really due to the state of the surface, he must, of course, be undersrood to speak under the qualification acutely referred to by Professor Bache, dependent on the fact noticed by Leslie, that radiation takes place not only from the surface, but from a certain minute, though sensible, depth, which differs in different substances. Taking this into account, the general meaning, as well as importance of the caution, will be manifest. In the sequel, Mr. Bache gives some very precise experimental proofs of the truth of the law just noticed, and shows, by successively adding fresh coats of the pigment, the precise limit beyond which such addition ceases to increase the radiating power, which, in fact, there comes to a maximum, and with greater thicknesses decreases.

Mr. Mackie made a communication respecting the Tides of Glasgow and Dundee.

Mr. Ettrick read a paper, "On the Two Electricities, and on Professor Wheatstone's

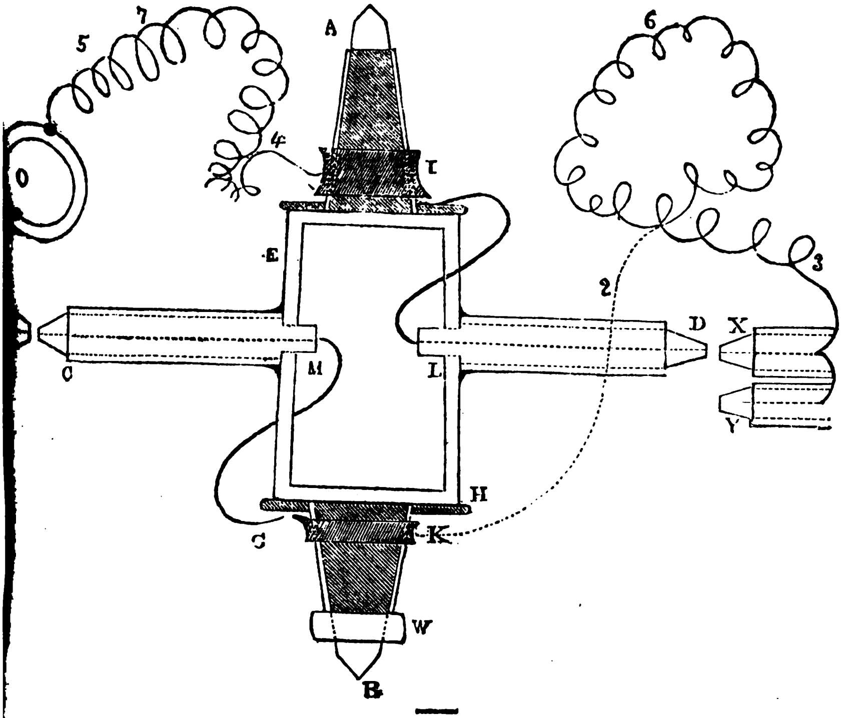
Determination of the Velocity of Electric Light." He stated, that he had read a paper before the Physical Section last year at the Bristol meeting of the Association, showing, that in piercing a card by the electric discharge, two or more holes are invariably made; and he contended, that they indicated the passage of two or more electric fluids, rather than two or more successive discharges. He then said, that such opinion had been confirmed by an observation made this year, on the spontaneous discharge of the Leyden jar, in which he had observed that the lines or marks made upon the glass of the uncoated part of the jar, are not single, as they appear to a superficial observer, but double; the two zig-zag lines going parallel to each other, however numerous the bends or turns may be, with one exception, where they cross each other on the outside. Though some parts of these lines appear as straight, or regularly curved lines; nevertheless, they are not so, but consist of an infinite number of minute sharp bends, which, by going in the same direction nearly, give it the appearance of a straight line. Whatever objections might have been made to the supposition of these two lines representing the passage of two distinct electricities before the discovery of the crossing of the lines, after such a remark, Mr. Ettrick contended, we have an ocular demonstration of it. He then stated, that he had repeatedly observed an appearance in the spark from coated surfaces, that indicated the passage of contrary electricities, not only when the discharge was made in an exhausted receiver, but also in common air. The spark appeared as if divided into two portions by three blueish bands of light, one at each end, and another in the middle, which could not be supposed to be the case by the passage of the electric fluid from one end only. He then showed, that the old remark respecting the brush of light upon positively electrified points, and the star on negative ones, could not be taken as any proof of the passage of the electricity in one direction only; because the appearances are greatly modified by circumstances. If the point be placed in a glass tube, drawn out to a fine point, then the only perceptible difference is in the length of the brush, the positive being twice the length of the negative brush. He said that, although experiments similar to these tended to show the passage of two electricities, nevertheless, they cannot be taken as absolute proofs, which, he contended, could only be directly proved by the visible passage of the two electricities, which Professor Wheatstone had shown a means of accomplishing. Mr. Ettrick then said, that it was much to be regretted that Prof. Wheatstone did not succeed in his first attempt to ascertain the velocity, but was obliged to resort to the secondary method by reflexion. He then described a machine, by which he had rendered the passage of the electric light visible without reflexion. To convey to our readers some idea of this instrument and its action, we give a cut (opposite page) representing the material parts of it.

Let A B represent the two points of an iron frame, moving in a solid cast metal stand. The central part of this frame is made square as at E G F H, and at the sides the hollow brass tubes C D are fixed, having the hollow insulating glass rods C M, D L, through which the copper wires C M G, D L F, pass and touch the pieces of brass K I, insulated by glass cones with flanges. At Z X and Y there are brass tubes having glass tubes, through which copper wires pass.

The action of the machine was stated to be as follows:—suppose the inner one of the two circles to represent the inside coating of a Leyden jar, and the outer circle the outside coating. If an electric discharge be supposed to pass along the wire O to Z, and leap the interruption from Z to C, it would then pass on through the wire C M G to K, then through the wire 2 to the coil of wire 2 6 3, which was said to be one mile and a half long, wnen it passed on to X, from thence to D L F I, where crossing the brass, it entered the coil 4 7 5, and went to the outside of the jar. This supposes the machine to be stationary, but if it be now supposed to be put in rapid motion, the point D moving from X to Y, and that the point C is opposite the point Z, the point D being also opposite the point X at the moment the electric fluid enters the coil at 2: then before it can pass through the coil 2 6 3, the point D will have passed the point X, and if the distance X Y be not too much, the electricity will strike the point Y, which is also connected with the coil of wire 2 6 3. Therefore, knowing the length of the coil, the diameter of the circle, through which the points pass, the velocity of the machine, and the distance of the points, we can easily ascertain the velocity of the electric light. Mr. Ettrick stated, that in a rough trial of it, the velocity was found to exceed 118,000 miles in a second of time, for it struck the point Y, when the velocity of the machine was eighty times in a second. the arms eighteen inches long, and the distance of the points one-tenth of an inch.

Several gentlemen objected, that the machine did not prove the same velocity as light, which seemed to be the great difficulty.

Professor Christie gave an acconnt of a singular optical phenomenon, sometimes seen at sunset.



SECTION B.—CHEMISTRY AND MINERALOGY FIFTH SITTING.

Mr. Deck of Cambridge, exhibited a new form of cast iron bottle, for obtaining oxygen from peroxide of manganese. It is to be obtained of Mr. Palmer, of Newgate-street, London,

Professor Johnston brought forward his Report in reference to Dimorphous bodies.

Dr. Faraday read a communication by M. Liebig on the products of decomposition of organic matters, paticularly the Uric Acid.

Dr. Thomson read a paper 'On the Specific Heats of Alcohol and Nitric Acid.'

Mr. Mushet brought forward the results of experiments, in reference to the waste experienced by Hot and Cold Blast Iron, during the process of refining.

Dr. Dalton communicated, throngh a friend, a short paper "On the Non-decomposition of Carbonic Acid by Plants." He calculates, that in 5000 years, animals supposed to live upon the earth, would produce but .001 of carbonic acid, so that the assistance of plants to purify our atmosphere is not necessary. By experiment, he found, that a hot-house does not contain more or less carbonic acid, *by night or by day, than the external air, and the results* were the *same in a number of repetitions* of the experiments. This paper was said to have been penned during the convalescence of its illustrious author from a late attack of illness, and was listened to with the greatest attention.

Mr. Robert Mallet read a paper, "On the Formation of Crystallized Metallic Copper, in the Shafts of the Cronebane Copper Mine, County Wicklow, Ireland; and of Native Sulphate of Iron and Copper, in the same locality."

Mr. Ettrick submitted to the Section a paper on browning gun barrels. After various experiments, Mr. Ettrick discovered that the process consisted wholly in procuring a *permanent* peroxide of iron, and then colouring such oxide. He had procured not only all shades of brown, but a perfect black, by mixing 1 part of nitric acid with 100 parts of water, and applying this to the barrel with a rag moistened with it. It is material that the rag should be only so much wetted as to damp the iron, for if the fluid be allowed to stream, the oxidation will be unequally performed. It is also material that the barrel should be well smoothed and polished, and all greasiness removed by chalk before the browning commences, otherwise a bright brown is not attainable. The barrel, after being wet, should be placed

for an hour or more in a window on which the sun shines, and when this process has been thrice repeated, the superfluous rust must be removed by a scratch brush consisting of a quantity of fine iron wire tied up into a bundle. This process being repeated eight or ten times, the barrel will have acquired as good a brown as it frequently receives from the common gunsmiths; but to do away with the disagreeable rusty appearance, it is necessary to proceed to colour the oxide, which Mr. Ettrick accomplishes by dissolving 1 grain of nitrate of silver in 500 of water, and applying this solution like the browning liquid. The number of repetitions of the nitrate of silver water would depend on the shade of brown required, but Mr. Ettrick found from 1 to 5 or 6 amply sufficient. The barrel is to be placed in the sunshine to obtain a dark colour. The last process was to apply the scratch brush freely, though lightly, and then polish the whole by bees' wax. Mr. Ettrick had, since the date of his own invention, discovered the process used by workmen generally, and long kept secret, but by the plan described, a much finer brown is attainable than that gained by the trade.

The concluding paper was by Mr. Robert Rigg, and related to what he denominates a peculiar property of the earth, and the changes which vegetables experience during the different stages of their germination and growth.

SECTION C.—GEOLOGY AND GEOGRAPHY.—FIFTH SITTING.

Mr. Dawson exhibited a collection of fossils from New South Wales.—Mr. Murchison communicated some information which he had lately received from M. Agassiz, who was bringing out some new livraisons of his great work on fossil fishes.

Mr. Griffith directed the attention of the meeting to a section of a district in Ireland, from Butler's Bridge in the county of Cavan to Benbulben in the county of Sligo.

The Rev. D. Williams exhibited a section of part of Devonshire, and read a paper "On some Fossil Wood and Plants recently discovered in a series of rock far below the culm field of Devonshire, being one of the results of an attempt to determine the relative age and order of its anthracite and floriferous shales and sandstone."

Mr. Hopkins made a communication "On the Refrigeration of the Earth."

SAME SECTION.—SIXTH SITTING.

Mr. R. W. Fox stated the result of some *experiments on the* Electricity of Mineral *Veins.*

The business of the Section ended with a paper from Mr. Hardman Phillips, "On the Anthracite Formation of Pennsylvania."—This formation occupied a space of 200 miles, by about 30 broad, having its beds often cropping out above the level of the running waters of the country. These beds are from four to nine feet in thickness, and the coal has a specific gravity of 1.279, containing 22½ per cent. of volatile matter. Its dip is generally very trifling, being one inch in a yard, so that it is easily worked by lead drifts: in one place, however, there is a greater dip, it there forming an angle of about 30°. It is used in the iron manufactures of Pittsburgh, but for smelting the ore the miners prefer charcoal.

SECTION E.—ANATOMY AND MEDICINE.—FIFTH SITTING.

Dr. Warren, of Boston, U. S., offered remarks "On some Crania found in the Ancient Mounds of North America." From the facts which he stated, he was lead to the following inferences:—1. The race whose remains are discovered in the mounds were different from the existing North American Indian. 2. The ancient race of the mounds is identical with the ancient Peruvian. To these conclusions might be added others tending to support existing opinions, but which are hypothetical:—1. That the ancient North American and the Peruvian nations were derived from the southern part of Asia. 2. That America was peopled from at least two different parts of Asia, the ancient Americans having been derived from the south, and the existing Indian race from the northern part of the same continent.

Professor Evanson was called on to read his paper entitled "A Critical Analysis of the different Methods that have been adopted for determining the Functions of the Brain."

Dr. Mackintosh addressed the Section on Cholera.

Dr. Carson read a paper, "On the motion of Blood in the Head, and on the Uses of the Ventricles and Convolutions of the Brain."

At the conclusion of the businesss of the Association, a colossal bust of Mæcenas which had been presented to the town of Liverpool, by the Chevalier Manni, was exhibited. The bust was of colossal size, of pure Parian marble, and perfect in every feature.

The next meeting of the Association is to be held in Newcastle-upon-Tyne. The Duke of Northumberland, *President;* Bishop of Durham, Rev. Vernon Harcourt, Prideaux John Selby, Esq., *Vice Presidents;* J. Adamson, Esq., Robert Hutton, Esq., Professor Johnstone, of Durham, *Secretaries;* Rev. W. Turner, Charles Bigge, Esq., *Treasurers.*

MEETING OF THE GENERAL COMMITTEE.—LAST DAY.

The following grants were proposed:—

Section A.—Mathematics and Physics.

For reduction of observations on the stars	£500
For discussions of tidal observations at Bristol	75
For hourly observations in meteorology	50
For repair of Whewell's anenometer, used at Plymouth	10
For extending the Catalogue of the Astronomical Society	500
For observations on waves	100
For determining the effect of gases on Sir D. Brewster's solar spectrum	100
For constructing a new anemometer, under the superintendence of Mr. Snow Harris	40
To the Meteorological Committee	100
For constructing a rock-salt lens	80
Total amount of grants to the Physical Section	£1555

Section B.—Chemistry.

For experiments on atmospheric air	£20
For continuation of table of chemical constants	30
For observing the effects of fresh and salt water on wrought and cast iron	20
For observing the effect of heat of 212° on organic and inorganic bodies	10
Total amount of grants to Chemical Section	£80

Section C.—Geology.

For continuing the observations to determine the relative levels of land and sea—*balance of a previous grant*	£272
For aiding the publishing of Agassiz's Fossil Ichthyology	105
For observations on the peat mosses (bogs) of Ireland	50
For experiments on mud and silt in rivers	20
Total amount of grants to Geological Section	£447

Section D.—Natural History.

For observing the growth of plants confined under glass	£50
For experiments on the preservation of animal and vegetable substances	25
Total amount of grants in Natural History Section	£75

Section E.—Anatomy and Medicine.

For observations on the absorbent and venous systems	£50
For observations on the effect of poisons on the animal economy	25
For the chemical analysis of animal secretions	25
For observations on the motions and sounds of the heart	50
For observations on the pathology of the brain	25
For experiments on lung-diseases in animals	25
Total amount of grants to Medical Section	£200

Section F.—Statistics.

For inquiries, purely statistical, into the state of education, especially in large towns	£150
For inquiries, purely statistical, into the condition of the working classes	100
Total amount of grants to Statistical Section	£250

Section G.—Mechanical Science.

For determining the strength of cast-iron, made by the hot and cold blast, and extending the inquiry to wrought-iron	£100
For printing Mr. Taylor's report on the duty of Cornish engines	50
For inquiry into the duty performed by one bushel of coals in pumping engines, not in Cornwall	100
For determining rail-way constants	50
For observation on the duty of one ton of coals in steam-vessels, estimated in horse power	100
If the inquiry be extended to America, an additional grant	50
Total amount of grants to Mechanical Section	£450

Total amount of grants for the Advancement of Science	£3057

Sir David Brewster said, that the exhibition of models had been a failure this year, because no one had been appointed to look after this new department of the Association. Sir David Brewster, Professors Babbage, Wheatstone, Willis, and Powell, Messrs. Abraham, Griffiths, and Robinson, then appointed a committee, to ma rangements for the exhibition of mecl models at the meeting of the Associa Newcastle.

NOTES AND NOTICES.

Fur in Steam Boilers.—Messieurs Neron and Kurtz of Brussels have advertised an invention for dissolving the "fur" which collects in kettles and boilers, and is found so serious a nuisance in all operations conducted by steam. For this they require a yearly subscription from those who avail themselves of it, of so high an amount as, in the case of steam engines, eight francs per annum for every horse-power. The German papers in taking notice of this, remark, that Mr. Bornschein of Frankfort on-the-Maine, announced a somewhat similar discovery in the early part of this year, but that by his plan, the "fur" is not dissolved when accumulated, but absolutely prevented from accumulating. For the disclosure of his method he only requires the sum of ten ducats, not yearly, but once for all. We should think that when this information reaches Brussels, Messrs. Neron and Kurtz will have few customers for their expensive wares, unless Bornschein's discovery be discovered to be useless.

A good Hearing for Dr. Reid.—Dr. Reid of Edinburgh, who gave evidence before the House of Commons' Committee on the best way of constructing a building for the purpose of hearing, with reference to the new Houses of Parliament, is now on an acoustic tour throught Europe, in order to examine the principal buildings with reference to their capabilities in that point of view. He lately paid a visit to Berlin and Potsdam—to the latter, it appears, for the purpose of examining the acoustic properties of the barracks. Our readers may be surprised at his pushing the ardour of research so far, but their wonder will cease when they learn that Dr. Reid is an Acoustic Commissioner, and travels at the expense of Government.

Locomotives for America.—We were highly gratrified at witnessing, in the course of the week, a trial of the locomotive engines manufactured by Messrs. Braithwaite, Milner, and Co., for the Reading and Philadelphia Railway Company. The workmanship of the engines is of a first-rate character. We are glad to know that the late commercial difficulties, which put so serious a check upon the enterprise of our transatlantic brethren, have so far been overcome that confidence is restored, and our railway manufactures for the American market are again in active operation.—*Railway Times.*

Telescopes.—A correspondent of the *Hereford Journal*, in reference to the inconvenience experienced from the condensation of moisture which is apt to take place upon the object glasses of telescopes in the atmosphere of the evening, says that it may be obviated by the employment of a tube of pasteboard 12 or 18 inches in length, so constructed as to fit upon the object end of the instrument. The invention, he says, was that of the celebrated astronomer De la Hire.

Artificial Rubies.—M. Gaudin has presented a report to the Institute of Paris, detailing his mode of proceeding in the preparation of fictitious rubies, which in every respect resemble those found in nature. He submits aluminium, with quantity of chromate of potash, previously c to the influnce of a powerful oxy-hydroge pipe, by the action of which the material is and on cooling, the crystal presents all the teristics of the ruby. The Academy appoi Becquerel to examine into the merit of the di and his report being deemed conclusive, pr their *thanks* to the author.

The Gresham Lectures.—Now that the G Professorship of Music is filled up by the of Mr. Taylor, there are three of the body w been chosen since the question of the ren the place of delivery, and the popularizatio lectures by altering the time of giving them f middle of the day to the evening, has been in a and care has been, it is understood, taken in stance, to bind down each new professor to conform to any plan adopted by the c council to effect those purposes. The pul therefore shortly expect that nearly one hal series (there are seven in all) will shortly be ed, in the evening, at the Theatre of the London Schools in Honey Lane. Fortunat at least of the new professorships are of which admit the most readily of populor illus astronomy, of which Mr. Pullen is profess music, the election of which has just take The third new lecturer is Dr. Southey, prof physic.

Literature in Turkey.—The Turkish Pen gazine, whose appearance we noticed son ago, is a reprint of our own Penny Maga which the printing and press-work are exe the expense of the Grand Seignior. It is e soon to equal in circulation the Turkish ne which has been established for some time now amounts to nearly five thousand, and pected to be quadrupled as soon as *the n office* arrangements are completed through empire!

Dublin Zoological Society.—This society establishment is situated in the Phœnix P just issued a stirring appeal to the public Irish metropolis, calling for immediate s tions, to the amount of at least 500*l.*, unless habitants of Dublin care not to see the soci solved, and its collection scattered wherever may determine. It appears that the funds from subscriptions, and the admission of are little more than sufficient to defray the expenses, and the interest of a debt of 1300*l* red by the society for buildings, &c. of this it is absolutely necessary that 500*l.* should forthwith, if the wild beasts are to be sav "execution," leaving 800*l.* which has been a by the members of the society, to remain a manent debt. The gardens appear to be enough, if we may judge from the fact, t number of casual visitors, paying sixpenc on an average of the last three years, has less than 150,000.

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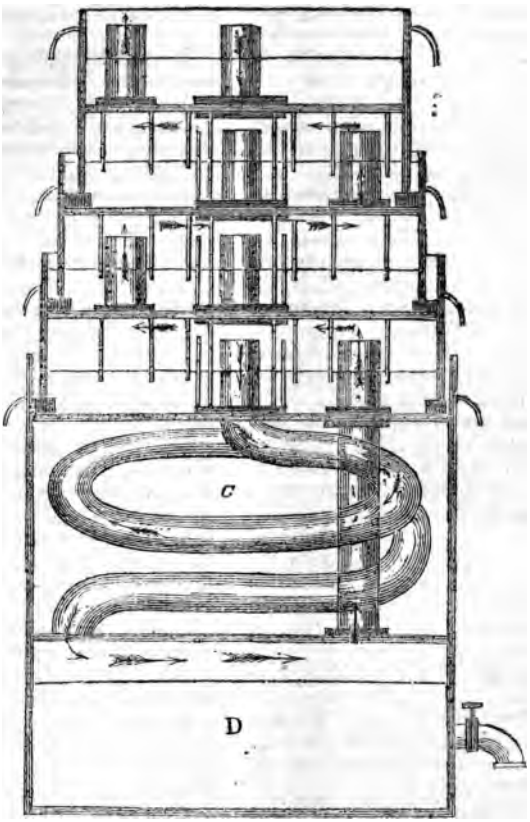
Mechanics' Magazine,
MUSEUM, REGISTER, JOURNAL, AND GAZETTE

No. 745.] SATURDAY, NOVEMBER 18, 1837. [Price 3d.

HUTCHISON'S MULTIPLYING GAS CONDENSER.

Fig. 1.



HUTCHISON'S MULTIPLYING GAS CONDENSER.

Sir, — Several interesting notices of Hutchison's machinery having appeared in your Magazine during the last three or four years, I am induced to send you a drawing and description of what appears to me to be an excellent form of condenser, being one of the early inventions of that engineer.

It is called the multiplying or reducing condenser, from the method of its construction rendering it capable of being enlarged or diminished, so as to suit the quality of the gas required to be condensed; and also to be easily adopted to the dimensions of whatever premises it may be placed in, whether large or small. It resembles in some degree the patent double lifting gasometer, (*Mechanics' Magazine*, No. 651) from its divisions or compartments being sealed against the escape of gas by hydraulic joints. The drawing, fig. 1 (front page), is a section of an elevation of the condenser, and fig 2, a cross section of the plan.

It will be seen that the apparatus consists of four distinct circular tanks, of different diameters; these tanks, according to their dimensions, are inserted into each other; the bottom part of the upper vessels resting upon a beading or slight projection of the lower tanks.

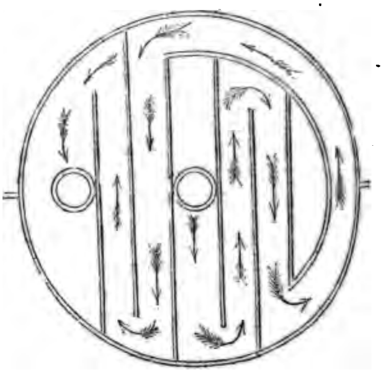
Every separate tank contains seven vertical partitions, between which the gas passes from an inlet pipe A, to the outlet B, after traversing over the surface of water in all the tanks and being conducted through a worm, which is surrounded by a body of cold water, contained in the division C.

The arrows indicate the direction of the gas in its passage to and from the condenser; and the plan, fig. 2, exhibits the extent of surface of water to which the gas is exposed by this method of condensation.

The lower part of the machine, D, is the reservoir for tar and other impurities of the gas, deposited during its progress through the ramifications of the condenser. These impurities are drawn off by means of the valve E.

It will be observed, that the partitions of each tank dip a few inches into the water contained in that one immediately underneath, so that thereby the gas must necessarily pass uniformly over the whole surface presented by the water in each compartment, as shown on the plan, fig. 2.

Fig. 2.



It must be apparent that the method here represented is advantageous in many respects, and especially in gas works where space is limited or expensive, as this condenser occupies less room than any other; and however much it may be found necessary to enlarge its capacity by increasing the number of tanks, still there will be no additional encroachment upon the space on the sides of the machine, as the enlargement will merely occupy the perpendicular space immediately above the apparatus. Therefore, in this point of view the invention is truly valuable, as the saving of room which is thereby effected, must to many establishments be an important acquisition. By the interception or obstacles which the partitions present to the body of gas flowing over the surface of water, its volume is so detached, separated, and subdivided, that the cooling influence of the water is exerted with great effect in producing that rapid deposition of tar and ammonia, which it is the desire of the manufacturer to get rid of.

From the constant deposit of salts and tar, and the oxydation of the cast iron, stoppages take place frequently in the usual condenser, thereby occasioning much inconvenience from the gas not passing with the necessary rapidity through the connecting mains. In order to remedy these frequently occurring evils, the common condenser requires occasional cleaning out, and this operation is done by detaching its different parts, a process which is attended with a serious loss of time, and in many

a total interruption (for a time) to ıufacturer.

ısits will also take place in the ying condenser, but unattended y of the above interruptions, as e simplicity of its arrangements, s may be detached, cleaned out, again united, in less than fifteen s.

ntinual stream of water may also ore facility be supplied to the cur- gas; the air-tight joints being by water, instead of iron, cement, ew bolts.

expense of fitting, and putting condenser generally used, besides at loss of time, is accompanied considerable outlay of money; ese objections are completely ob- by the multiplying condenser, as ks of which it is formed may be and made perfectly ready for work v hours.

ı having had considerable ex- e in the operations of gas facto- d having paid more than ordinary on to the process of purifying and sing illuminating gas, I am con- that this condenser is one of the erfect that has ever fallen under servation.

Yours respectfully,

F. H. Bothwell.

OVEMENTS IN GAS MANUFAC- TURE—RETORT SETTING.

For years past the public mind has ıtently engaged in the investiga- f those principles which regulate ion of the steam engine—the ge- stablishment of railroads—and the ting of gas for the purpose of illu- ng our streets and public buildings. are so many important interests lent upon the successful results of rises founded upon our present edge of these engrossing subjects, ıe scientific man and the specula- apitalist, are, in order to shield reputation from blame, and their ty from destruction, required to e a more than usual degree of ob- on and judgment. Practical in- nce on such important subjects therefore be peculiarly acceptable *present time.*

ı not acquainted with any work, *ı this respect has* rendered more service to the community than the *Mechanics' Magazine*; we find that its pages contain invaluable records of the progress of science, and ample illustration of those improvements which the ingenuity of our countrymen is daily making in the construction of machinery. Indeed, to the engineer and mechanician, whose employment at a considerable distance from the capital, necessarily prevents his acquiring that scientific information which the public institutions of London afford, the volumes of this useful periodical have been of incalculable benefit; and the contributors must derive more than ordinary pleasure in being able through this source to give universal publicity to their ideas and discoveries. I, for my own part, feel a satisfaction in acknowledging, that upon every occasion which I have been obliged to refer to this Magazine for information, relating, especially to gas machinery, I have been greatly assisted by the practical suggestions it has offered. Conceiving, that by means of its pages I may render a service to an important class of the community, I am induced to offer a few brief remarks and observations, which from a lengthened experimental knowledge, I am enabled to make, on the manufacture of coal gas.

I am persuaded, that wherever the production of this now indispensible article is conducted with skill and economy, it may be rendered a source of substantial profit; on the other hand, if inexperienced persons are employed, a great loss will most assuredly be the result.

It is generally known that the improvements made in the arrangement and application of gas apparatus within the last few years have materially reduced its cost; and this reduction has been productive of most essential benefit to the public. Many companies, however, persist in continuing in the beaten track, and are consequently by their more enterprising competitors, left completely in the back ground.

The large sum of money now embarked in this description of property, is of sufficient importance to warrant any individual who is anxious for the public good, to direct the attention of all who are interested in the success of this trade, to the necessity for completely reforming and remodelling the manufacturing department of gas establishments. In order

to effect this object, I address myself to the Editor of the *Mechanics' Magazine*, in the confidence that the circulation which this work has in our provincial towns, may create that desire for the protection of the interests of the shareholders, which is absolutely required.

In recommending the abandonment of a ruinous system, and the immediate substitution of a profitable method of manufacturing gas for supplying light, I am not guided by an attachment to any favourite speculative theory; nor do I stand forth as an advocate for untried inventions; on the contrary, I trust I shall be able to make it perfectly evident, that the operations of the retort house are, in many cases carried on after a most crude and ruinous system. As it is only by contrasting principles, and by instituting a fair comparison of the different effects produced by two known systems of machinery, that our judgment can be directed in estimating the merits or defects of either, I shall endeavour to illustrate my argument by an immediate reference to the places where the opposite processes of generating coal gas, are in constant practice.

It will scarcely be credited, that in towns of so much importance as Manchester, Birmingham, and Bristol, the manufacture of coal gas is conducted on principles at variance with all economy. The shape of the retorts, the objectionable manner of setting them, and the small number placed in each bed, are alarming instances of extravagant waste of iron, fuel, and building materials. If the matter be investigated, it will be ascertained, beyond contradiction, that not less than 25 per cent. is annually thus sacrificed. The economizing of heat (which, next to the coal, is the most valuable material employed in the retort house,) is particularly deserving of the study and attention of the professional superintendant; indeed the receipts or outlay of the company are more influenced by skilful management, or neglect of this department than any other; yet it cannot be denied, that in this instance, and in the above named towns especially, no advantage whatever has been taken of one of the greatest improvements that have yet been made in the application of fuel to the retort bed.

The improvement I allude to has been in successful operation for years, and has been productive of immense saving wherever it has been practised. It consists in the principle of arranging eleven retorts of large dimensions over one furnace; this excellent method of placing retorts is the invention of Mr. S. Hutchison, the engineer of one of the metropolitan companies, and a very accurate description of the manner of constructing the flues was given in the *Mechanics' Magazine* (No. 671). Now previous to this plan being introduced, five retorts, and these too of a small size, in one bed, and in many instances two furnaces were even considered necessary to heat them; each of those furnaces consumed as much fuel as that, which according to Hutchison's method is necessary to heat his eleven retorts of greater capacity. In many establishments, not only in our country towns, but in the capital, the heat of two furnaces is expended in generating gas from seven and a half bushels of coals contained in three retorts. In Bristol the absurdity of the system is carried to the utmost extremity of wasteful extravagance. It is a fact, that the article is produced in the works that light that city, by placing only one retort over a separate furnace! A similar prodigal system prevails in Oxford, and many other important towns throughout the kingdom. In Brighton they have declared against iron retorts, altogether. In their works, brick ovens are now in use, and in them the distilling process is performed. I believe the coal account of this establishment is about 3,800*l.* per annum; now this sum might be reduced to 2,000*l.*, were it not for the indulgence of this singular and expensive fancy for brick ovens. It certainly would be a matter of difficulty to estimate the quantity of gas, which escapes from the numerous rents and fractures caused by the heat of the furnace on an oven used for this purpose; but it may be safely inferred, that the proprietors lose not less than 40 per cent. per annum!

But the employment of this objectionable description of retort is not confined to Brighton; the custom prevails in other places. The principle argument used in defence of this system is, that the wear and tear of iron retorts is obviated; now this mode of defending the practice is not justified by experience. For are not clay, brick, or stone retorts liable to wear and tear? And, although the ori-

ginal outlay for the purchase of iron retorts, is more than that which is expended in the purchase of clay, brick, or stone retorts, yet we are satisfied, that it is by far more economical to use the former than the latter in the retort beds; especially if the flues are constructed upon the principle laid down by Mr. Hutchison. It must be apparent to practical men, that immense quantities of gas will escape through the fractures of clay vessels, and that there is no method of checking, or even estimating the probable loss thereby occasioned.

Without entering more into detail, I trust I have said enough to induce those who are interested in the prosperity of gas establishments to direct their attention to the study of the subject. If it were merely the proprietors of ill-conducted establishments that suffered from this evident neglect of their own interests, the subject might not be so generally regretted; they deserve to pay the penalty for their blameable supineness and folly. But the public are injured in a two-fold degree; first, in consequence of the price of the article being greatly enhanced by the extravagant mode of producing it; and secondly, that capital being uselessly absorbed in the mismanagement of a trade, which might be more beneficially employed otherwise.

Yours, &c.

PETER PINDAR.

EVANS'S GAS-RETORT BED.

Sir,—Having had frequent opportunities of seeing the different settings of retorts at the various gas works, both in town and country, I have observed they are in general very defective with regard to economy in fuel, and their applicability to the burning of tar.

Having heard that Mr. J. Evans (the engineer to the Chartered Company's Gas Works, Horseferry Road) had retorts set on an entirely new principle, of eight retorts to two fires, and eleven retorts to ditto, I obtained leave to see them, and was shown over the works by the foreman, and I must say, that for uniformity of heat, *and the small consumption of* fuel, *they are superior to any I have ever seen. They also possess that great* desideratum *in retort settings, of being* applicable to the burning of tar as fuel with breeze, (as well as coke) without that destruction to the fire work, which I have observed in other settings. They are applicable to any sized ovens, and can be set with three, four, or five retorts to one fire, or six, eight, or eleven retorts to two fires.

Yours obediently,

"VERAX."

London, Nov. 6, 1837.

HANCOCK'S PATENT CAOUTCHOUC BOOKBINDING.

While numerous very important improvements have recently taken place in every other department of the mechanics of book making, that part of binding, which consists of attaching the leaves together, has hitherto remained stationary, if indeed it has not retrograded. That this want of progress in the march of improvement, is not to be ascribed to any perfection in the art as usually practised in the present day, will readily be admitted by every one who is familiar with its details, who has a library, reads a book, or is in the practice of making entries in ledgers or other account books. Mr. Hancock, in his patent process of binding books with caoutchouc, or India rubber, (an article which has made such rapid strides in usefulness within these few years,) is the first that has effected any improvement in the operation in question; and that improvement is a most important one. The qualities of caoutchouc, its elasticity, its adhesiveness, and its being impervious to the ravages of damp and insects render it an article admirably adapted for the purpose to which it has in this instance been applied; and we think there is little doubt, but that it will in a short time totally supersede the use of stitching, paste, and glue.

Mr. Hancock's invention consists in the binding of the leaves of books together by a solution of caoutchouc, or India rubber, by various methods, the books being composed of either single leaves, or sheets of any number of folds; dispensing altogether with the operations either of stitching, sewing, or sawing-in, and of the use of paste or glue in the backs. Instead of the leaves only being bound together by stitches at two or three points, the caoutchouc takes hold of the whole length of the leaf, in some of

the varieties of Mr. Hancock's patented methods, and of a greater portion of it in others. The caoutchouc may also be used in conjunction with stitching, a back, however formed in this way, although of course stronger than with the caoutchouc alone, will not open quite so freely.

The advantages resulting from the adoption of Mr. Hancock's patent caoutchouc bookbinding are numerous;—the following are stated by the patentee, to be amongst the most obvious. As regards books for the library—bound in the patented manner, they will open with much greater facility, and when opened, lie perfectly flat, or more nearly so than books bound in the ordinary way; thus preventing all strain on the backs, as well as obviating the necessity of keeping the leaves apart by force while reading, either with the hand, a weight, or otherwise.

In many extensive public and private libraries, the ravages of the insect produced in the paste, and by damp, have been most troublesome and destructive. Caoutchouc is impervious to both these evils. As regards collections of costly engravings, particularly when of large dimensions, and atlases, to these, the caoutchouc binding is particularly applicable, each leaf being attached with great tenacity, A large map, or chart, or even an engraving may be doubled, and bound into a book of half its size, and the fold at the back of the book, when open, be scarcely perceptible. For music books, the leaves, when bound with caoutchouc, will not fly back after the V. S. operation, as they now very frequently do to the interruption of the performer, and often to the marring of a fine passage of music. Manuscripts and collections of letters, where, in the writing of them no margin is left at the back by which they can be stitched, may be bound without the least encroachment upon the writing. And, more particularly as regards ledgers and other account books—every one having any thing to do with book-keeping must have experienced the inconvenience of writing in a day book or ledger, towards the inner parts of the leaves especially, when the back, as is usually the case with such books, is of considerable thickness. The impossibility of obtaining a flat surface with ledgers, &c. bound in the ordinary way, not only retards the operation of writing, but renders it extremely tiresome, besides producing blots and stains from the difficulty of applying the pen to the paper at the proper angle; in many cases also a portion of the breadth of the sheet of paper being wasted. Mr. Hancock's patent method of binding, he states, produces such elasticity in every part of the back, that it is equally convenient and easy to write, whether the book contain fifty or five hundred leaves. That these advantages are duly appreciated, may be learned from the fact, of the approval of the invention by all the great mercantile establishments to which it has been introduced, and by the first account book makers in the trade.

RISE AND PROGRESS OF MECHANICS' INSTITUTIONS.

It is now just fourteen years since the London Mechanics' Institution flashed into existence, as it were, amid a general and genuine burst of enthusiasm. It is scarcely necessary to add, that nearly all the bright expectations then formed, have since been disappointed, and that now, at the distance of "two apprenticeships" (to use an expressive and very applicable phrase) from the rise of Mechanics' Institutions in England, they do not exist to one hundredth part of the extent, regarded either as to numbers or efficiency, that even a reasonable man, with his eyes on the brilliant and promising prospect then opening before him, might well have anticipated. We have been led into these reflections by the appearance of a volume* recently put forth by a body styling itself "The Central Society of Education," in which one of the most interesting articles is a paper devoted to a sort of survey of the origin and present condition of Mechanics' Institutions. The paper is sufficiently remarkable for the candour with which the writer ascribes the merit of originating the metropolitan institution, the parent of all the rest, to the proper parties. This is the more to be wondered at, from the circumstance that the author acknowledges

* Central Society of Education. First Publication. Papers by Thos. Wyse, Esq. M. P., Dr. Reid, F. R. S., Charles Baker, Esq., &c. &c. Also, the Results of the Statistical Enquiries of the Society. London: 1837. Taylor and Walton. 8vo., pp. 414.

is obligations for much of his informa-on to the Useful Knowledge Society, e *Noble President* of which has so con-picuously distinguished himself by ob-inately persisting in the assignment of e honour to Dr. Birkbeck, in spite ven of his own conviction to the con-rary. But it is not for this alone that e consider the paper worthy of atten-on; it deals in other details well worthy f observation.

It is almost tautological to say, that lechanics' Institutions were originally ntended for the benefit of the working echanic; and it is but too true that the orking mechanic has received but little enefit from them. The officers of the London establishment, our readers are ware, have always strenuously opposed any proposition for publishing a statement of the numbers of the members who are really working men, distinguished from those belonging to the other classes of society. In the absence of such a document, the production of which had hitherto been resisted with success, it may be worth while to obtain as much light upon the matter as may be afforded by the returns from other institutions, the officers of which are not so scrupulous. The paper in question furnishes the returns relating to Sheffield and to Birmingham, both of which are highly valuable for the light they throw upon a subject which, nearer home, is studiously shrouded in darkness. At Sheffield, the last report gives the numbers, discriminated as follows:—

"Private gentlemen	15
Professional men	52
Merchants and manufacturers	85
Tradesmen and shopkeepers	35
Clerks and warehousemen	61
Etchers, engravers, modellers, and painters	36
Employed in Sheffield trades	160
Masons, joiners, &c.	61
Schoolboys	22
	527"

From this it appears that the great majority of members belong to classes whose admission was hardly contemplated at the time when Mechanics' Institutions originated. Of working mechanics (marked in italics), it will be seen here are only 221, while the members rom the classes including "private gentlemen, merchants and manufacturers, clerks," &c. &c., amount to no less than 306. What is the state of the case in London? Would it turn out that the proportion is still more monstrous there? We have little doubt it would. The case of Manchester may, perhaps, be nearer in point, where, as will be seen from the statement below, the majority of non-mechanics is quite overwhelming.

"Principals, engaged as merchants, manufacturers, or machinists	305
Mechanists, millwrights, and engineers	117
Overlookers, spinners, and other mill hands	58
Building trades	92
Sundry trades, chiefly handicraft	78
Warehousemen	164
Clerks	240
Artists, architects, engravers, &c.	52
Professional men	13
Schoolmasters	15
Shopkeepers and their assistants	111
No profession	18
Ladies	21
Youths	242
	1526

Out of the whole number, only 345 belong to those classes for whose especial improvement such institutions were *at first exclusively intended*, while the remaining 1181, the great mass of the body, consist of persons who, according to the original idea of such establishments, must be considered as intruders!

The *genteel* classes outnumber the *mechanical* by upwards of three to one. Was such a state of things ever anticipated when Mechanics' Institutions commenced their career? We "pause for a reply."

In the metropolis, be it remembered, the Mechanics' Institution cannot boast even of so many members as that of Manchester. Out of the thousands upon thousands of working men who compose a large portion of the million and a half of human beings constituting the population of London, there are, even ostensibly, but a few more than one thousand who belong to its only institution for the improvement of their class, and of *that thousand*, who shall say how many are really and truly what the whole ought to be,—working mechanics? These graduated lists of the Sheffield and Manchester institutions come in aid of conjecture to support the opinion, that probably not more than one-fourth of the whole are, in point of fact, what their patrons profess them to be. If not, why do those patrons so firmly withstand all attempts to make public the statements which would set the question at rest?

It is, indeed, useless to deny that, from whatever cause, the expectations of the friends of the mechanic, founded on the establishment of institutions for his instruction, have been disappointed. It has especially occurred, as if to thwart the best founded anticipation, that our large manufacturing towns have failed to avail themselves of their advantages to any thing like the extent that the most sober watches of the signs of the times might have looked for. Liverpool, indeed, now possesses an institution worthy of her standing; but it has only recently been "plucked from the depths" of failure by individual exertion, and the application of individual capital. The state of those of Manchester and Sheffield may be gathered from the papers we have quoted: but what is the condition of Birmingham, the great midland metropolis of manufacture, where, if anywhere, the system might be expected to take root and flourish most exceedingly? Here, no large capitalists, anxious for the honour of their town, have as yet stept forward to bolster up the *so-called Mechanics' Institution*; it has *been left to its own resources, without adventitious aid,* and the result is thus detailed in the pages of the Education Society's publication:—

"The Mechanics' Institution at Birmingham has never given that promise of success which might have been anticipated in a town so justly celebrated for its manufactures and mechanical skill; the number of members has not in late years exceeded 300; and this number has seldom been sustained throughout a whole year. Discouraging circumstances exist; such as a small debt, and the difficulty of raising a sum of money by the united means of shares and donations, to erect a building suitable for its wants. Classes are, however, in operation for teaching writing, arithmetic, drawing, mathematics, French, Latin, and English grammar; and the improvement of the pupils is spoken of by the committee in terms of commendation. The library contains about 1000 volumes, and lectures have been delivered on a variety of most interesting subjects; yet the operations of the institution are very confined, considering the population of the town, and the occupations of its inhabitants. It would be easy to mention several Mechanics' Institutions, situated less eligibly as to local circumstances, and with fewer prospective benefits to their members, which are, nevertheless, in a more thriving condition; having larger funds, and a greater number of members. There is no town in the United Kingdom so dependent on the spread of intelligence, whose prosperity is involved so much in the skill and knowledge of its artizans, as Birmingham. It is therefore not a mere matter for the consideration of the mechanics themselves, whether they shall be accomplished in the principles of their arts, or ignorant of every thing but the mechanical practice of those arts; but it is a question on which the trade of the town depends; whether it must not keep pace with its powerful rivals of the old and new continents; or whether its bankers, merchants, factors, manufacturers, and professional gentlemen, will, by timely and well applied exertion, contribute to maintain that pre-eminence which the town has so long possessed, and of which nothing but the disregard of scientific knowledge can deprive it."—p. 234.

This, it must be owned, is a most humiliating posture of affairs. That only three hundred members, and those not permanent ones, should be found to support a Mechanics' Institution in such a town, is matter for surprise and sorrow. And yet are affairs, even here, in so deplorable a state as in the capital? We have called the Southampton-buildings

Institution the only one of the kind in all London; and if any of the local societies which were once set up in various parts of the suburbs do still exist, it must be in an obscurity so intense, that the light of day cannot penetrate it.* No other is ever heard of, at any rate; and yet that institution, in a city whose population is ten times that of Birmingham, cannot boast of four times as many members as the Birmingham one, even in its present depressed condition! To add to our surprise, the state of things in several of the smaller unmanufacturing towns presents a complete contrast. To prove this, no more is needed than to turn again to the book which has already been our authority.

"The population of Chichester, the centre of an agricultural district, is 8270. This town has a Mechanics' Institution, with upwards of 400 members, and two branch societies in the neighbouring hamlets,—Bognor and Selsey. The terms of admission are, for minors, four shillings a-year; for majors, six shillings. Lectures are delivered every fortnight; the library contains 1000 volumes; and there is an apparatus consisting of an electrical machine, an air-pump, a microscope, a telescope, a pair of globes, and a good chemical apparatus. The branch societies are managed by committees formed in the villages from among the farmers, one of whom officiates as secretary, collects the subscriptions, and sends periodically to Chichester for a box-full of books, either chosen by members, or selected by the committee. Lectures are delivered in these villages every third or fourth week, which are attended by forty or fifty people. This plan might be extensively carried out if its good effects were more generally known. Classes have not succeeded at Chichester, owing to the irregular attendance of gratuitous teachers, the funds not allowing paid teachers.

"At Lewes, another agricultural district, a Mechanics' Institution has been well sustained. The number of members is upwards of 200, and the attendance on lectures from 100 to 300; the library contains 1200 volumes, which are much sought after."

Here we have Chichester, with its mixed population of little more than eight thousand, supporting its Mechanics' Institution with more spirit than Birmingham, with its huge manufacturing population of pretty nearly twenty times the extent; and two little villages in the vicinity enjoying literary advantages which are quite inaccessible in scores upon scores of towns and villages in the manufacturing districts, as superior in extent and number of inhabitants to Bognor and Selsey, as Birmingham is to Chichester,—or rather infinitely more so.

——"Can such things be,
And overcome us like a summer's cloud
Without our special wonder?"

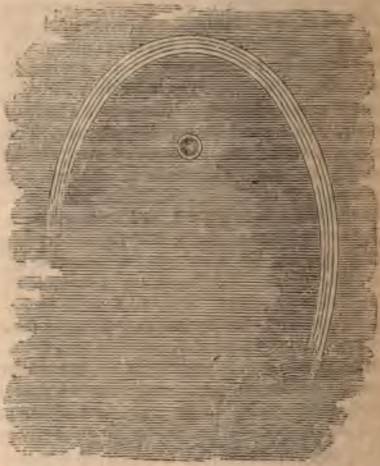
It would be an invidious task to attempt to point out the circumstances which have led to such an anomalous state of affairs. The apathy of the working classes themselves is undoubtedly one of the greatest. But then it was the aim of the originators of Mechanics' Institutions to rouse them from this apathy; and the failure in effecting so desirable a purpose well calls loudly for a strict and earnest inquiry into its exciting causes. We incline to believe, that one of the most pernicious errors committed, has been the not confining the benefits of such establishments to mechanics alone. They belonged to a class which had imagined itself excluded by its position from a participation in the advantages of literary and scientific information, and, from long-formed habits, could hardly be brought to think themselves other than intruders on a proscribed domain, unless it were made evident that the institutions they wished but feared to join, were theirs, and for them alone. The feeling may be ridiculous, but it undoubtedly exists; and when, after a time, the *soi-disant* Mechanics' Institutions came to be more than half composed of members from other, and what are generally considered higher, classes of society,—when several dropped the distinctive title, and became merged in the general mass of mere *literary* institutions, the working man found all his old misgivings returning, and withdrew from societies in which he began to think himself in some sort an alien; his place was soon filled up from the classes of more educated habits, and things returned to something like their ancient order in times ere libraries or lecture-rooms for mechanics were "born or thought of."

* One of the vice-presidents of the London Mechanics' Institution, when examined before the House of Commons' Committee on Arts and Manufactures, by way of showing how the plan had spread, *not only adduced all the suburban literary institutions, but, with a grand flourish,* the "*Mechanics' Hall of Science;*" *a room opened by private parties, chiefly, for disseminating* the doctrines of *Tom Paine!*

Another cause of the decline, we cannot help thinking, has been the character of the instruction,—if instruction it can always be called,—dealt forth, especially by means of lectures, at many of the institutions. It is evident, that the best possible series for a Mechanics' Institution, would be plain and easily understood discourses on the elements of the sciences, and their application to the useful arts, illustrated by numerous experiments. Many such lectures *were* given at the commencement of the system, and doubtless with the happiest effect. For some time, however, a very different plan has been adopted. Science, and especially elementary science, has been in a great measure laid aside, or only allowed to take its place with subjects of mere amusement or temporary interest. The models of machinery have disappeared from the lecture-room to make way for the piano-forte and double-drum; and some fifth-rate actor from the minor theatres has been retained to murder Shakspeare, on the spot where the workman should have been made familiar with the inventions of a Watt or an Arkwright; the first positions of dancing have been more attended to than the five mechanical powers; and one lecture on chemistry has been followed by a dozen on the history of chivalry and the crusades! All these things must have had their effect; they have sapped the foundations of the edifice, if silently, it is to be feared too surely.

The over-importance attached to lectures, is in itself, perhaps, no inconsiderable cause of the decline complained of. They are, doubtless, good in themselves; but too high an opinion seems to be generally formed of their powers. The lecture-room should always be made subservient to the library; on almost every subject, more information may be gained from one book than from fifty lectures, while there is scarcely any from which complete satisfactory information is to be gained by listening to the lecturer without referring also to books. It has usually been taken for granted, that large towns would always enjoy an advantage over small ones in the superior quality of the lectures they could command; but it will be seen from our last extract, that not only does Chichester enjoy as great privileges as Birmingham in this respect, but that two very small villages in its neighbourhood fully participate in them. And after all, the inhabitants of Bognor and Selsey may, perhaps, be as fortunate in this particular as the more wealthy and favoured places which attract the visits of the "crack lecturers" of the day. Sure we are, that if they can procure a decent reader to give out with due emphasis and discretion the easily-accessible masterpieces of Emerson or Fergusion, Young or Arnott, illustrated by apparatus which might soon be within the reach of every village that could boast of a clever hand or two at the most usual trades,—they are better off for lecturers than the great majority of the large towns that pride themselves on their expensive institutions.

SOLAR PHENOMENON.



Sir,—Being between towns on the 24th of August last, about 4 o'clock, P.M., a very fine afternoon, with a little spare time on my hands, I was sauntering along the towing path of a canal, contemplating the smooth surface of the waters, when my eye caught the reflected image of the sun, its brilliancy somewhat softened by light fleecy clouds, and at a distance, I should say, of about 15° from it, appeared a rainbow, not in the common form of an arc, but in that of an ellipse; considerably more than one half

of which was visible; had it been complete, I should imagine its conjugate and transverse axes would have been as 3 to 2, and its lower limb would have extended nearly as low as the visible horizon. It was well defined, although the colour was rather faint. The annexed rough sketch will, perhaps, give rather a better idea of it, with the sun apparently in one of its foci; its left limb loses itself in a light cloud, and its right, which descends much lower, appears to rest on a darkish one; it was much darker within the bow than without. I had the pleasure of viewing it and its reflection for upwards of three-quarters of an hour. No rain had fallen in the neighbourhood on that day.

Yours, respectfully,

TREBOR VALENTINE.

Derby, Nov. 2nd, 1837.

MR. UTTING'S ASTRONOMICAL TABLES.

Sir,—My motive for having sent you the Astronomical Question (vol. xxvii, p. 366,) was in consequence of the dispute between a Scotch Dominie and Mr. Utting, C. E., relative to the *true method* of determining the synodic periods of any of the planets. The Dominie insists that the synodic period of a planet is obtained from the equation $S = \frac{Pp}{p-P}$, P being the siderial or periodic period of the earth, and p that of a superior planet; or in the case of an inferior planet $S = \frac{Pp}{P-p}$. It is very true, that Mr. Utting has given us no formula or equation for determining the synodic periods of the planets; still, however, it is abundantly manifest to every one who knows any thing about the subject, of deducing the synodic periods of the planets must have been obtained from the equation $S = \frac{TT^1}{T-T^1}$ or $S = \frac{TT}{T^1-T}$; where T and T^1 are the tropical periods of the earth and planet, or from some other mode of calculation deducible from this last equation; and this the Scotch Dominie (No. 734,) has demonstrated in the clearest way possible. But, Mr. Editor, my principal object at present is to make a few remarks upon Mr. Utting's solution of my own question.

Mr. Utting, *instead of taking* his own tropical period of the earth, as given in his first Astronomical Table, or (what he should have taken) its mean periodic revolution, takes a mean Julian year of 365¼ days; he then presents us with the equation $\frac{P}{n-p} = 487$; the number 487 he must have previously determined by some mode of calculation which he does not explain; and this method of going to work might be fairly styled "putting the cart before the horse." He ought to have stated, because, $\frac{Pp}{P \pm p} = n$; from this equation we obtain $p = \frac{Pn}{n \pm P}$; that is the case of a superior planet, $p = \frac{Pn}{n-P}$, or if an inferior planet $p = \frac{Pn}{n+P}$. If we adopt Mr. Utting's numbers, then $p = \frac{366 \times 365\frac{1}{4}}{366 - 365\frac{1}{4}} = 178242$ days; therefore, $178242 \div 366 = 487 =$ to the number of conjunctions of the earth and planet: consequently, the earth must have made 488 Julian revolutions, &c. But why in the name of common sense has Mr. Utting adopted the Julian year? He surely knows, or at least ought to know, that the results produced from any astronomical calculation founded upon that supposition must be false: or is Mr. Utting so fond of bringing out all his answers in whole numbers, that he will sacrifice truth itself to obtain that object.

In imitation of the Scotch Dominie. Suppose we assume the periodic revolution of the earth 365.256384 days, $n =$ 366, then $p = \frac{366 \times 365.256384}{.743616} =$ $179775+$ and $179775 - 178242 = 1533+$ that is the error produced by Mr. Utting's using a false period of revolution (a revolution of 360° he should have thought of) amounts to something more than 1533 days in one periodic revolution of the planet. It is almost unnecessary to add, that the distance computed by Mr. U. from his premises is also untrue. In one thing, however, Mr. U. has acted wisely, and that is, in not using his own tropical period of the earth; this, at least, shows that he must have some misgivings about the accuracy of the principles upon which his

first Astronomical Table is constructed. The only thing I requested, was to know the distance a superior planet should be placed from the sun, so that its synodic period, with the earth, should be performed in n mean solar days.

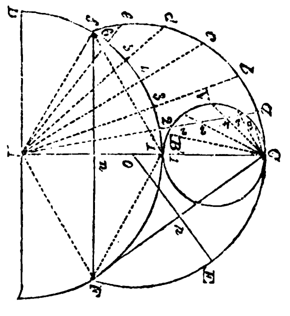
Let D = distance of the earth from the centre of gravity of the solar system; x that of the required planet; then by Kepler's Third Law we have $x^3 = D^3 \left(\frac{p}{P}\right)^2$ and substituting for p its value, we obtain $x^3 = D^3 \left(\frac{n}{n-P}\right)^2$. Consequently, $x = D \left(\frac{n}{n-P}\right)^{\frac{2}{3}}$ = distance for a superior planet; and the only limitation in this case is, that n must be greater than P. If we were to suppose $n = P$ the value of the expression $D \left(\frac{n}{n-P}\right)^{\frac{2}{3}}$ would be infinite. If we suppose the planet to be an inferior one, then $\frac{P\,p}{P-p} = n$, from which we find $p = \frac{P\,n}{P+n}$; in that case, $x = D \left(\frac{n}{P+n}\right)^{\frac{2}{3}}$ and here, there can be no limitations, unless we conceive that n is infinite, or in other words, that a synodic revolution can never happen in that case, $\left(\frac{n}{P+n}\right)^{\frac{2}{3}} = 1$, hence $x = D$.

Yours, &c.

A CAMBRIDGE STUDENT.

Nov. 6, 1837.

A GEOMETRICAL METHOD OF GENERATING THE EPICYCLOID.



Sir,—This subject having been introduced to the notice of the British Association at their meeting by Mr. Willis, who gave a brief exposition of a method for the formation of the teeth of wheels, the writer has been induced to submit the following paper, with great deference, to the notice of practical mechanics:—

The epicycloid is generated by the motion of a point inserted in the periphery of a circle rolling on the periphery of a stationary curve, the curves being to each other in a given ratio. The entire surface of each curve being divisible by a given quantity, equal to the surface of one tooth in each wheel. The theorems, or rules, annexed will, it is presumed, facilitate the operation, the writer having found them useful in practice, and more exact than any other method, the wheels working freely, with the least possible friction.

Mr. Willis observes that, the "driver should be an external epicycloid, and the driven one an internal epicycloid, in which case they will move each other truly." The writer concurs in this view of the subject, each circle being separately made base, and the generant equal the lesser wheel.

In the figure annexed, D B F, is a part of the base, and B C the diameter of the generating circle in the ratio to each other of one to three, and the point C as the circle moves to f, or F will trace the semi-curve C for C F. The exterior of each curve being divided into equal parts, the equal spaces will accurately measure each other. In this case, the generating circle being one-third of the base, the semi-circumference of the generant, or 180° will be equal in space to 60° of the base; hence, the length of the semi-epicycloid, or any required part, may be found as follows:—

Take r = A B radius of the base; a = B C diameter of the generating circle C = the chord of the arc C 1, 2, 3, &c. &c. as may be required. Then, as $r : \overline{a+2r} :: C : \frac{c\,a+2\,c\,r}{r} = \frac{c\,a}{r} + r\,c$ = the length of the required part of the epicycloid. But C 1 = C B = diameter of the generant; c will universally be equal to a × by the natural sine of half its own arc; and if we take C = the chord of 180° ÷ 2 = 90°, whose natural sine is 7; then $a \times 1 = c$ in this case, $\frac{a^2}{r} \times 2\,a = L$, the

length of the curve, or $\frac{c\,a}{r} + 2\,c = L$.
This theorem is general, and will apply to any given chord of the required arc. To determine the chord of the semi-curve C F, complete the equilateral triangle A B F, and let fall the perpendicular F n from the angle F. Determine F n and A B = B F and $\overline{BF^2} - \overline{Bn^2} = \overline{Fn^2}$; then $\overline{nC^2} + \overline{nF^2} = \overline{CF^2}$ and $\sqrt{CF^2}$ = C F chord of the epicycloid. Then to determine the radius of curvature, we have given $\frac{CF}{2} = C\,p$. Then put x = the remaining part of the diameter, the versed sine p E being given. We have $p\,E + x = \overline{C\,p^2}$ and $\frac{C\,p^2}{PE} = x$. Then $\frac{x + PE}{2}$ = radius of the curvature of the epicycloidal curve.

Construction.—Assume the ratio of the circle to be as one to three; make the larger circle base (radius A D) and draw the circle B C. Than take the number of divisions in the generant at pleasure, say 12, then 180° ÷ 6 = 30° of the circumference, equal to one division, or tooth. Then from the point C draw chords 1, 2, 3, 4, 5, 6, dividing the semicircle into six equal parts of 30° each. The ratio of the circles being as three to one, the correspondent divisions on the base will each equal 10°. Divide the base from B into equal parts of 10° each, making the terminus of the epicycloidal curve at 69; and from the centre A draw the lines A 1, 2, 3, 4, 5, 6, produced to a, b, c, d, e, f. Then the diameter B C will be the chord of 180°, and C will be the central part of the required curve. Then on the base set off c 2 from 2 to a, and c 3 from 3 to b, c 4 from 4 to c, c 5 from 5 to d, and c 6 from 6 to e. That is, set off the exact length of each chord successively of the generant circle from the several points 1, 2, 3, 4, &c. in succession on the circumference of the base. Then the points a, b, c, d, e, f, will all be points in the epicycloid. Draw the chord C F, which bisect in p, and draw E p r perpendicular to C p F, and the locus of the point r on diameter A B is the radius of curvature, taken from c to r; with $r\,c$ draw the curve $c\,f$ through the several points C, a, b, c, d, e, to f, and complete the epicycloidal curve e.

H. J. RAYNER.

Butterley Iron Works, Oct. 28, 1837.

ACCIDENTS IN COAL PITS.

Sir,—As your correspondent, "Carbon," is, it seems, taking a little breathing time, you will, perhaps, in the interim, allow me to make a few observations on the same subject. My object in asking this permission, is neither to praise, nor to censure, the late Parliamentary Committee, for what they have done, or neglected to do. In neither respect do I intend going farther than to recommend, as "Carbon" does, a careful perusal of their Report and Minutes of Evidence by all persons interested in mining operations. I am, however, at once desirous of correcting two very prevalent, but, in my opinion, erroneous, notions, of preventing explosive accidents in coal pits; particularly, as they are not confined to persons whose opinions are generally disregarded. One is, rendering the gas harmless by chemical means; the other, preventing its accidental ignition by using insulated lamps only; that is, lamps supplied with air from the exterior of the pit. Neither of which I consider practical while coal mines are worked solely for profit, on account of the cost. This will be very evident to those who look properly at the nature of a coal pit. Few are at less depth than five or six hundred feet below the surface of the earth; some are nearly twice that depth. The under-ground workings are longitudinal, and transverse passages cut in the body of the coal. These subterranean passages are involved naturally in utter darkness, and are generally of great extent. In some pits, particularly those of the north, they extend many miles. Indeed, the air by which the mine is ventilated, not unfrequently has to make a circuit of twenty, or even thirty, miles from its entrance down one shaft to its exit up another. The idea, therefore, of carrying pipes through this extent of passages to supply air to the miners lamps, is quite as far out of the question, as the neutralizing such immense volumes of inflammable gas as are constantly passing from such mines as the Walls-end, Jarrow, and a hundred others on the banks of the Wear and Tyne. From the Walls-end colliery alone, as much carburetted hydrogen is daily discharged, as would, it is said, if it could be so applied, light the whole of Newcastle as completely as it is now lighted

by the gas company. After what I have said, it may be asked, as the modes referred to of preventing explosions are shewn to be impracticable, are we to be content with the present management of coal pits, while hundreds of industrious men are yearly destroyed in them. I say, no. A great alteration, a very great one indeed, is required in the management of these places. For although I may not be inclined to go so far as "Carbon" does, in saying that "in the present system of mining every thing is considered of more value than human life," yet I must say, I consider that nearly all the accidents in coal pits happen from the ignorance, obstinacy, or inattention of the persons intrusted with the chief management of them. For instance, the use of naked lights is still persevered in. The Davy-lamp is constantly used without a shield, and is frequently allowed to become *red hot* by the workmen, who, for want of being informed of their danger, remain longer than they ought in an inflammable atmosphere, although Sir H. Davy himself stated, that in either case his lamp was liable to cause an explosion. And, again, the care of the air-doors, a most important matter in a coal mine, is still entrusted to the care of children of a tender age. This practice, in particular, was severely reprobated by the Parliamentary Committee; but it seems no good has resulted from such reprobation, as the same conduct is, I believe, pursued at the present hour in every mine in the counties of Durham and Northumberland. I am aware, Sir, that some benevolent persons go to the extreme, that no mine ought to be worked that could not be safely worked with a naked light. This, I think, is going beyond what is reasonable or necessary. That every possible means should be taken to give the working collier a safe and wholesome atmosphere is too obvious to question. But surely there is a wide difference between the putting a stop to the working hundreds of coal mines, which, by proper care, could be safely worked, and the preventing the managers of them ignorantly and obstinately exposing the lives of the workmen to unnecessary peril. Although I deprecate, as much as any one, a busy meddling, whether legislative or not, with trading pursuits, yet I think, in this instance, a case is made out which calls loudly for l[...] tive interference. At least 300 p[...] have been destroyed by avoidabl[...] dents since the Parliamentary Con[...] delivered their report.

I remain, Sir,

Your obedient servan[...]

A Constant Re[...]

INCOMBUSTIBLE THATCH[...]

Sir,—In Number 743, there i[...] cussion on a subject which I lool[...] as highly important to the "rural[...] lation" of this and every other c[...] where houses, barns, and other [...] ings are so often covered with st[...] thatch.

It is announced, that a Mr. Barentin, of Leipsic, has inve[...] method of rendering the thatch[...] buildings fire-proof. Alum, as i[...] observed, will render all vegetable [...] or fibres incombustible; that is, [...] plication in solution will preven[...] burning in a flame. Any one ma[...] this with a piece of sheet or old [...] handkerchief. But then, it bein[...] ble, the rain will wash out the alu[...] carry off the preserving substanc[...] haps the day after its application.

A sure and cheap method of [...] ing straw thatch incombustible, w[...] have experimented upon and pro[...] my entire satisfaction, is to satur[...] thatch once with a solution of l[...] water, or with what is common[...] as whitewash. The addition [...] pound of alum to every five gal[...] whitewash, will greatly impro[...] composition, and it will remain [...] pellicle of lime which covers every[...] so as never to be washed out [...] rain. I have poured a bucket of [...] wash over a heap of dry furze; th[...] it in the July sun until as dry as[...] ble, and then (let any man try it) [...] not burn, even aided by ten [...] bellows.

When any building is being th[...] what more easy and cheap than t[...] paying the straw with such white[...] It will also prevent corruption[...] cause the thatch to last incomp[...] longer than that of clean straw[...] course, the solution of lime shoul[...] the addition of a little size. Th[...] size, and alum will form a crust [...] ble in water, protecting each [...]

which it adheres. Of course, the straw next the house must be protected as well as the exterior.

I wonder how any family can sleep quietly under a roof that may be set in a blaze by a spark from a chimney, or from a pipe, or a cigar, or a flash of lightning! We almost daily hear of people being burnt out of their cottages in Ireland, by the thatch being ignited. I hope your readers will think of this preservative, try it, and promulgate its importance.

I have the honour to be, Sir,

Your obedient servant,

FRANCIS MACERONI.

LORD WILLOUGHBY'S MACHINE FOR THE MANUFACTURE OF FUEL BY THE COMPRESSION OF PEAT.

(From the *Literary Gazette*).

The expedition of steam, in its appliances by land and sea, is ever opening new ways and means to wealth; a slight scientific discovery shows how readily natural productions may be transported, in perfection, from one end of the earth to another, and countries clothed with additional beauty and fertility; well conducted experiments teach how to impart facility and safety to the port, or how to form the very wave, and ride it triumphantly with sail and merchandize; and other carefully calculated operations in farming demonstrate that the waste may be reclaimed with advantage, and the most useless soil be forced to contribute to the wants of man. In this latter instance, we allude to the reclamation of beat-bog in Ireland by Lord Clonbrock, confirmed and corroborated by the testimony of the several individuals who had enjoyed opportunities of trying or witnessing similar labours.

The subject is, however, more especially pressed upon our notice by the Session of the Highland Societies at Dumfries, and the various suggestions and examples for improving the country to which it tends. Among these, it has been our good fortune to be eye-witness to a very simple, but, in our opinion, immeasurably important work, which, in an earlier stage (about a year ago), was described in our columns—we refer to the compression of peat or turf, so as to render it nearly, if not quite, equal to coal, not only for domestic consumption, but for mechanical and manufacturing purposes. We are indebted to Lord Willoughby d'Eresby for persevering through them all till he has conquered the difficulties opposed to this task, and finally and fully accomplished the object at which he aimed. In the first place, the fabrication of a machine to perform the operation was no slight obstacle, for its requisites were cheapness, ease in working, and efficiency. The two former being overcome, the latter demanded much ingenuity to discharge the moisture freely, and yet retain every particle of the combustible material. By simplifying the press, increasing its power, and wrapping the masses of peat in coarse linen, the consummation has been arrived at; and, a few days ago, we saw the wet and ragged turf, both of the surface and lower stratum, condensed in a few seconds to the hard, nearly dry, and shapely dimensions of a convenient article for firing. This sample was sent to the Highland Society; but we speak from our own observation of the process. From the first weight of 8 lbs., it was reduced to about 5½ lbs., by the discharge of 2½ lbs. of almost pure water, or 30 per cent. In bulk the reduction was nearly one-half; and, when dropped from the press, there was a firm and compact body, fit, as we have said, for every economical and useful purpose.*

It will be allowed that we do not overrate the importance of this fact, when the circumstances attached to it are taken into account. First, in immense tracts of boggy country, where there is no other fuel, the very necessities of life are supplied by the common cutting of turf, and casting and drying of peat, which, after all, make but an indifferent fire. Yet it costs the labourer and his family much toil and much time. The original preparation is little to the long journeys, week after week, and in a changful climate, to turn and sort the peats, so as to get them dry enough to burn, a desideratum not always achieved. Now, with Lord Willoughby's invention, the cotter and his family may make plenty of excellent firing, not only for their own consumption, but for sale to neighbours otherwise employed; and this of an infinitely superior material. It surely is not imaginative to foresee, from the single piece of substance now before our eyes, the capability of immense effects. Instead of the bare and imperfect supply of the absolute want for subsistence, we have that which is better, cheaper, more easily, and more abundantly made. We have a fuel which can be applied to every agricultural and manufacturing purpose; to the burning of lime, the smelting of iron, the propagation of steam; in short, to everything which can ameliorate the condition of a population, and plant industry and activity where only idleness and wretchedness

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* A description of Lord Willoughby's Peat Pressing Machine appeared in the Mechanics' Magazine, No. 725.

prevail. In the midst of the wild moor, the factory, with its engines and machinery, may raise its head; whilst the earth around is forced to assume the healthy forms of cultivation and productiveness. If we look at Ireland, the consequences cannot be calculated. The north of Scotland, too, offers a grand field for this improvement. In truth, it is altogether one of those happy inventions which need only to be followed up with alacrity and spirit to

"Scatter blessings o'er a smiling land."

LIST OF IRISH PATENTS GRANTED IN OCTOBER.

Pierre Barthelemy Guinebert Debac, of Brixton, Surrey, for improvements applicable to rail roads.

Archibald Richard Francis Rosser, of New Boswell Court, Middlesex, gent., for improvements in preparing manure, and in the cultivation of land.

John Joseph Charles Sheridan, of Ironmonger Lane, London, for improvements in the several processes of saccharine, vinous, and acetous fermentations.

Charles Wye Williams, of Liverpool, for improvements in the means of preparing vegetable material, peat moss, or bog, so as to render it applicable to several useful purposes, particularly for fuel.

NOTES AND NOTICES.

Popular Mechanics.—A knowledge of the mechanical arts should be afforded in all schools for the children of the working classes. This is a point strongly insisted upon by Mr. Duppa in his pamphlet on "Industrial Schools," issued under the superintendance of the Central Society of Education. Labourers or mechanics, (says Mr. Duppa), besides the peculiar work of their vocation, have their homes to attend to, when they return of an evening, the earnings of the day are rarely sufficient to purchase all the comforts, even the necessaries of life. The vegetables from a well-cultivated garden would add greatly to the resources of a family; while the flowers would nourish a sense of beauty and harmony of colour, and shed a cheerfulness and a brilliancy around their dwellings. Carpenter's tools, used with a small portion of skill, would enable them, at the expense of a little and agreeable labour, to keep the interior of their dwellings in a state of neatness; to construct cupboards, shelves, and the more simple portion of their furniture; while the power of mending a shoe would be found very convenient, and save many a shilling. Clothes, shoes, shelves, or lockers thus constructed would, no doubt, be inferior to the work of regular mechanics, and it might be objected that an introduction of an imperfect knowledge of these crafts would be unsound in an economical point of view; and so, no doubt, it might be were the agricultural labourer always able to dispose of his labour to advantage, and profitably to occupy the whole of his time. Taking, however, into consideration the number of wet, snowy, or frosty days in the year, in which he can neither do his duty by his employer, (or himself,
if at task work), it is clear that an arrang
which, besides dispelling the listness cons
upon a day of forced idleness, as in these ins
would provide for his now lost time being l
to advantage, is paramount to all other con
tions. But added to the necessaries and co
of life, man wants amusement; he is but
being without it; and after training the chil
habits of skill and industry, the next busine
be to show them how they can be merry and
unless innocent amusements are suggeste
means for obtaining them afforded or facil
others of a pernicious description will be s
Cheerfulness and activity do not often acco
vicious habits. The ale-house is the resort
person who knows not what else to do wit
self. The promoting innocent and meaning
ments is part of a schoolmaster's most
business.

Legislative Prussian Improvements.—Wi
coming year a singular new law will come in
ration in Prussia. It is expressly intended
"restriction of freedom of trade." For the
It will be necessary to procure a licence to se
business, and this is not to be granted till
plicant has undergone an examination with
to his qualifications for the trade he has chos
shows that he possesses sufficient property t
it on. The object of the law is said to be to
swindling, and the ruin often caused by the
dous speculations of those who, possessing
perty themselves, are indifferent about risk
property of others. The effect of it will obvio
to keep classes where they are, and to bring
one into still stricter subjection than hitherto,
powers that be. To us it appears about as
able as an improvement in the police, by
every one should be compelled to undergo a
mination, whether he was, or was not a thief,
cess by which thieving might perhaps be ke
der a little more than it is, but by which
strikes us there would take place a slight a
ment of personal comfort and liberty. As t
light, however, comes from Prussia, it will no
excite the admiration of the numerous lau
that "enlightened" despotic govarnment, its
of education and all that thereunto belongs.

Taylors' Scientific Memoirs.—The first
of this collection of translations from the
scientific periodicals is now completed, and
sorry to find that the editor and proprietor h
to complain of a want of adequate patronag
has suspended the continuation of the work
present, to give an opportunity for men of
to comeforward in its support, before he co
himself by commencing the second volum
the great utility of such a publication is too
fest to admit of doubt, and a moderate num
subscribers is all that is required to ensure i
manency, it is to be hoped that Mr. Taylor's
will not be made in vain, especially as, by t
already published, it appears that a consid
portion of the requisite number is already ob

French Steamers.—The French are at p
quite on the *qui vive* as to the application of
to locomotive purposes. One of the last-s
companies in Paris (where they are very ri
now) is a joint stock concern for the naviga
the Marne, not by the clumsy barges now i
but by iron steam-boats! The introduct
steam bids fair to work a complete revolutio
few years, in the river as well as the coast n
tion of France.

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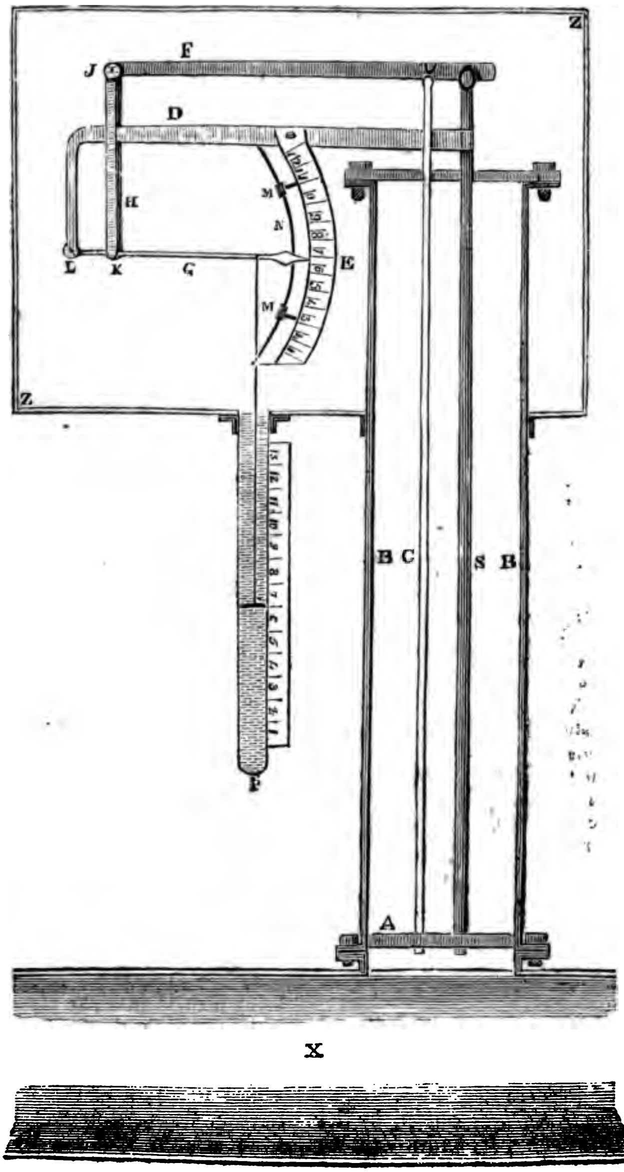
Mechanics' Magazine,

MUSEUM, REGISTER, JOURNAL, AND GAZETTE.

No. 746.] SATURDAY, NOVEMBER 25, 1837. [Price 3d.

GIBBONS'S HOT BLAST THERMOMETER.



X

GIBBONS'S HOT BLAST THERMOMETER.

Sir,—The iron masters who use the hot blast are well aware how essential it is, to the regular working of the furnace, that its temperaturce should be kept as steady as possible. With a view to this object I have constructed a thermometer which (upon trial at my friend, Mr. John Gibbons's furnaces here,) seems to answer its purpose exceedingly well, and I herewith send you a slight sketch and description of it. By inspecting this instrument, the keepers, or superintendant, can ascertain at any moment, and *without the least trouble* how the teazer is performing his duty;—and to the teazer himself it is very useful from the quickness and accuracy of its reports; after a little experience with it, it is surprising how exactly he will hit upon and maintain any given heat; and this is of great consequence, particularly when the iron masters work (as they do here) with a varying temperature, according to the quality of the iron that they intend to produce. It is hardly necessary to say, that the power of the instrument is derived from the different expansions of the steel and copper rods when exposed to the influence of high temperatures.

I am, Sir,

Your obedient servant,

WILLIAM GIBBONS.

Corbyn's Hall Furnaces, Dudley,
Nov. 10, 1837.

Description of Engraving.—B, a pipe, in the lid of which are two small holes, through which the rods C and S project. These holes should be left a little open round the rods to permit a small current of the hot air to pass up the rods.

A, a bar fixed across it.

C, a copper rod, } fixed in the bar A.
S, a steel rod, }

D, a bent arm fixed on the rod S, carrying the scale E and the rod N, on which the registering slides M M, move. These self-registering slides will show the extreme variations of the temperature of the blast from time to time; they constitute the master's check.

F, a lever resting on the rod C, and connected with the rod S by links.

J, the end of the lever F, from which H, a pair of links are suspended.

G, the finger which is carried by the links H, at its centre, K, and which, at *its other centre,* L rests on the bent *arm D.*

Z, box inclosing the whole apparatus.

P is a glass tube fixed in the bottom of the box, in which a small index is suspended by a thread to the finger G, that shows on the scale attached to the glass tube, the heat at which the teazer is to keep the blast.

X, the main blast tube.

MOORING BALLOONS.

Sir,—Your correspondent, Mr. Baddeley, in your last number states, that in a conversation with me a short time since, I informed him that the plan of fastening the grapnel-rope to the netting of the balloon, according to the suggestion of Mr. Hitchins, in your 741st Number, was now always pursued. Mr. Baddeley must have misunderstood me. With regard to our balloon (and I believe all others now in use), the grapnel-rope is invariably attached to the *hoop* for the purpose of avoiding the very danger which Mr. Hitchin's supposes such a mode would cause; for, as the car hangs about 4 feet below the hoop whatever situation the latter may be thrown into, the former always maintains a position nearly horizontal. The plan of attaching the rope to the netting would, in my opinion, be found in rough weather a highly dangerous one.

I am, Sir,

Your obedient servant,

FREDERICK GYE, JUN.

Royal Gardens, Vauxhall,
Nov. 16, 1837.

ANSWERS TO THE QUESTIONS PROPOSED BY "HOMO." VOL. XXVIII. P. 37.

QUESTION I. "I observe by my clock that the hour hand is between the hours of nine and ten, and that the hour and minute hands are in opposition. Determine the time; also when the hands are at right angles with each other, and when next in conjunction."

1. The circumference of the dial plate being divided into 720 parts, (instead of 360 degrees,) each division for the minutes would contain twelve of those parts; while the minute hand advances 1 part $= \frac{1}{720}$th of the whole circumference, the pendulum being the standard length, would make five vibrations; while the minute hand advances 1 minute = 12 parts, the hour hand

would advance one part, and the pendulum make sixty vibrations.

At nine o'clock the hands were at right angles with each other. Subtract the number of parts the hour hand would advance in sixteen minutes from their distance when at right angles, (180 parts,) and add the remainder to the number of parts advanced by the minute hand in the same space of time; if the result is 360, the hands must be in opposition. But $180 + (16 \times 12) - 16 = 356$. The minute hand will advance the four deficient parts, while the hour hand advances one-third of a part, therefore the minute hand must advance $\frac{1}{3}$ more; then, $180 + 196\frac{1}{3} - 16\frac{1}{3} = 360$. While the minute hand advances $196\frac{1}{3}$ parts, the pendulum will make $981\frac{2}{3}$ vibrations, for, $196\frac{1}{3} \times 5 = 981\frac{2}{3}$; therefore, 16 minutes $21\frac{2}{3}$ seconds past nine o'clock is the instant when the hands will be in opposition.

2. When the pendulum has made $981\frac{2}{3}$ vibrations more, the hands will be at right angles with each other (32 minutes $43\frac{1}{3}$ seconds past nine o'clock). And, 3. When the pendulum has made $981\frac{2}{3}$ vibrations a third time, the hands will be in conjunction; for $981\frac{2}{3} \times 3 = 2945$, or 49 minutes 5 seconds after nine o'clock; also, the original distance was 180 parts; the advance of the hour hand 49 parts; ($16\frac{1}{3} \times 3 = 49$.) $180 - 49 = 131$; then, the distance of both hands for XII., when in conjunction, will be 655 parts, ($131 \times 5 = 655$.) for $2945 + 655 = 3600$ = the number of vibrations per hour.

Question II. "Admit the hour, minute, and second hands of a clock to revolve about the same axis. Determine the possibility of the dial-plate being trisected; and also the time at the instant of trisection. Supposing the hands to be in conjunction at twelve o'clock."

1. Giving the instant of trisection, will determine the possibility of the dial-plate being trisected.

When the hands are 120 degrees (or 240 parts), distant from each other, the dial-plate *will be* trisected.

Every kind of angle will be formed by the hands, from the moment they are all in conjunction at twelve o'clock, before they come to the same place again, *i. e.* in *twelve hours; the hour* and *minute hands, or the hour* and second *hands, or the minute* and second hands, will frequently be in opposition, with the other hand perpendicular, and thereby forming two right angles at the same moment, nor will there be a moment (except the instant when *all* are in conjunction,) without an angle of some kind being formed; the *impossibility* of the dial-plate being trisected, is therefore the *most difficult* to determine.

2. While the minute hand advances 480 parts (two-thirds of the circumference), the hour hand will advance 40 parts (the pendulum will make 2400 vibrations), therefore their distance will be 440 and 280 parts, instead of 480 and 240. The minute hand will advance 48 parts, while the hour hand advances four, and will make their distance 484 and 236 parts; therefore, the minute hand will have advanced four parts beyond the point of trisection; the four parts are equal to twenty vibrations of the pendulum, during which, the second hand would advance 240 parts, or exactly one-third of the circumference; the instant of trisection is, therefore, when the pendulum has made 2604 vibrations from the moment they were all in conjunction at twelve o'clock. While the second hand makes one revolution, the minute hand advances twelve parts, and the hour hand one part. While the minute hand advanced the last forty parts, the second hand would make three and one-third revolutions; but the hour hand having advanced forty-three parts, it (the seconds hand) must advance forty-three parts further, which would be the instant between the third and fourth vibrations of the pendulum, for it advances twelve parts at each vibration of the pendulum. $240 + 48 = 288$; which, divided by $12 = 24$ seconds, (one-fourth of a second too much), and gives 43 minutes 24 seconds as the time required.

A Journeyman Clock Maker.

Lichfield, Nov. 4, 1837.

OYSTER SHELL AND LIME MANURE.

Sir,—There are one or two points in the letter from Colonel Maceroni, inserted in No. 743, which seem to call aloud for remark. A former correspondent, "Calx," had suggested the employment of pounded oyster-shells as manure, whereupon the Colonel puts in his claim to priority of invention,

on the ground that he has been "aware of their beneficial qualities as manure" for the last fifteen years, and has "used them in his own garden with advantage." Now, as it happens, neither "Calx" nor the Colonel can lay any valid claim to the discovery. The value of oyster-shells, as manure, has been generally known much longer than fifteen years: —yea, even the necessity for pounding them small has been so well understood, that, long before the "fifteen years" to which the Colonel's claim extends, it was a regular employment for the paupers in divers of the London workhouses to pound the commodity as small as conveniently might be, for the use of the farmers of that day. It is not altogether improbable that the same process may be in activity even now,—so that the Colonel will know where his hints as to the easiest method of breaking, will be most valuable; unless, indeed, they shall prove to have been forestalled, as most probably they have been, "long, long ago"!

Colonel Maceroni is much further at sea as to the article lime. He tells us of a writer in the True Sun, who recommends the farmers to apply lime in the shape of powder, as manure; and makes very merry at the expense of the said writer, because he has not told the "agriculturists" how to reduce the "hard limestone" to powder. I dare say he thought they would hardly require telling; for, it is indeed rather surprising, that even the Colonel should be ignorant of the method. Has he ever seen any of *his countrymen* engaged in "slacking" lime at a building? If not, let him keep a sharp look-out in that quarter, and he will soon discover the whole secret. He will see that they have only to throw water over the "hard limestone," after it has been properly burnt, and that the hard limestone gives no further trouble, but forthwith "reduces" itself to powder! This process, which is assuredly tolerably simple, is so very generally known, that the writer in question may well stand excused for thinking it unnecessary to enter into a discussion of it. Who he may be, I know not, but I am afraid he, like the Colonel, is "a day after the fair." It certainly seems rather strange that, at this time of day, somebody should be recommending the *use of lime as a manure*, and should the "agricultural interest" vote the happy individual a piece of plate for his advice, it may be thought worth while to point out the propriety of making *an experiment*, at any rate, with horse-dung!

The Colonel touches upon other matters, in his letter, which are somewhat too recondite to be lightly meddled with; the hybernation of swallows, to wit. The Colonel may well be expected to know as much as any person of the powers of this bird, for, as the readers of the *Mechanics' Magazine* are aware, he has made more experiments on the "capacity of *swallow*" than here and there one. He alludes to the habits of *humming-birds* also, as confirmatory of his ideas, in such a way as to show that perfect familiarity with the habits of that class of the animal creation, which might be expected from him. I am sorry, however, if the Colonel's statement of his friendship with a certain Baron, and if the said Baron's moral habitudes be correct, (and who shall doubt it?) it will be absolutely necessary to cancel a good old ornithological proverb* from all future collections of "wise saws" backed by "modern instances"!

And I remain, Sir,

Very respectfully, yours,

H.

London, Nov. 15, 1837.

CRANE'S METHOD OF SMELTING IRON WITH ANTHRACITE COAL.

Sir,—In your Magazine of last month, I observe an extract from a Cambrian of a very old date, respecting my application of anthracite coal, to the purpose of smelting iron stone.

As you have also given a brief notice of a paper which I read to the Chymical Section B, at the late Meeting of the British Association at Liverpool, and as the perfect success of the experiment is such as to show that it must shortly have a very material influence upon a very important trade—the iron trade, I have sent you the *Cambrian* newspaper, in which you will find a full report of the paper which I did deliver, and which I shall be obliged by your transferring to the columns of your Magazine. More particularly as it was *mis-reported* by the

* Can this be "birds of a feather flock together?" —Printer's Devil.

majority of the newspapers who published the proceedings of the British Association at its late Meeting at Liverpool,

Your most obedient servant,
GEORGE CRANE.

Ynyscedwin Iron Works, near Swansea,
Oct. 6, 1837.

"*On the Smelting of Iron with Anthracite Coal.*

"The great extent of the deposit of that description of fuel, called anthracite or stone coal, in the mineral basin of South Wales, accompanied as it is with iron mine in great abundance, and of good quality, has long made it an object of great interest to parties connected with that district to discover some method of applying that description of coal to smelting purposes.

"One of the earliest patents enrolled in this country for this object was that of Mr. Martin, in 1804. From the mode detailed in his specification, there does not appear to have been any peculiarity in his process; he evidently expected to have succeeded in using this fuel by the only mode of blowing a furnace then known, that by cold blast. Another patent was taken out about twenty years afterwards, for a mode of forming a conglomerate coke, composed partly of the small of the anthracite veins, locally called culm, with a sufficient portion of the small of the bituminous or binding veins, to cement the whole, when coked in an oven together. Had this latter plan been attended with success, its application would, of course, have been limited to those localities where the two descriptions of coal were to be found near each other.

"Ynyscedwin Iron Works, which are in my possession, are placed upon the anthracite formation. Until I discovered the method of applying this particular description of fuel to the smelting of iron ore, I was obliged to avail myself of the coal of the bituminous veins, obtained from the adjoining parish of Kilybebill, for the supply of the blast furnaces at Ynyscedwin.

"During the fourteen years in which I have been engaged in the iron trade of South Wales, I have had my attention anxiously directed to the application of anthracite coal to smelting purposes, and had at different periods, at a large outlay, tried a variety of plans, but without success, until the idea occurred to me, that a hot or heated blast, upon the principle of Mr. Neilson's patent, might, by its greater power, enable me to complete the combustion of this very peculiar coal.

"I have *completely succeeded in the application of anthracite coal to the smelting of* iron stone ore;—I have used no other fuel in a cupola blast furnace since the 7th Februry last, and the success of the experiment in the combination of hot or heated air with the coal in question, as fully detailed in the specification of my patent improvement, enrolled in March last, has been, in every respect, of so satisfactory a description, whether with regard to the quantity of the iron produced, the quality of such iron, and the economy of the process, that I am now, and have been for the last three months, actively engaged in making the necessary preparations for the introduction of anthracite coal, instead of the coke of the bituminous veins, upon the whole of the blast furnaces which I at present have (three in number) at the Ynyscedwin Iron Works;—I have renewed all my mineral takings in the anthracite part of the basin for 99 years, and have arrangements in contemplation for a large extension of the works, in consequence of the perfect success which has resulted from the experiment.

"One of the three furnaces at present on my establishment is a small cupola furnace, which we call No. 2, built from the top of the hearth with firebricks only. This cupola is of the following dimensions:—41 feet in its whole height, 10½ feet across the boshes, and the walls of the thickness of two 9-inch bricks; the hearth 3 feet 6 inches square, and 5 feet deep. The two other furnaces, which we call No. 1 and No. 3, are thick stone walled furnaces. Some years since, I found that this cupola furnace, No. 2, had, on the average of a long period, I concluded from the smallness of its dimensions, and the thinness of its walls, taken so large an excess of minerals to the ton of iron produced when compared with the quantity taken on the average of the same period by the stone walled furnace, No. 1, standing within fifty feet it, that I determined to erect a second furnace similar to the latter one, in lieu of it. The meeting will shortly understand why I am giving these details, which may at the moment appear not to be very interesting particulars. This cupola furnace, No. 2, not being at work when I arrived at the determination to try the experiment of the combination of hot blast and anthracite coal upon the large scale, it was more convenient to put this furnace into blast for the purpose, rather than to interfere with the usual progress of my business by experimentalizing in either of the two other furnaces.

"The cupola furnace, No. 2, from the causes which I have before explained, had, on the average of a long period, taken cokes the produce of 5 tons 3 cwt. of coal to the ton of pig iron, when the stone walled furnaces had not required cokes to the ton of

metal produced, quite equal to four tons of coal. The consumption of iron stone and limestone had been greater in the former than in the latter description of furnace, but not to so great an extent.

"I will make another explanatory remark on this part of the subject. The two description of furnaces have worked in so different a manner with the minerals of my neighbourhood, that, whilst the barrow of cokes, weighing about 3½ cwt., would take, when consumed in either of the stone walled furnaces, a charge or burden of 5 to 5½ cwt. of calcined iron mine of the descriptions obtained in my neighbourhood, according to the kind of iron which I was desirous of producing, the same barrow of cokes in the No. 2 cupola, or thin-walled furnace, would only carry from 3 to 3½ cwt. of calcined mine of the same kinds. Under these disadvantageous circumstances, I have actually produced from the No. 2 cupola furnace the ton of iron in the smelting process, on the average of three months, with less than 27 cwt. of anthracite coal. The heating of the blast and and the calcination of the mine require of course, upon my plan, the same quantity of fuel which is necessary for the like processes in other establishments.

"With regard to the quantity of iron produced, the result which I have to report is equally satisfactory. I must not, however, omit to mention that, for the greater convenience of filling this cupola furnace, No. 2, from an adjacent gallery, previous to the commencement for my anthracite experiment, I raised it in height from 36 feet 6 inches to 41 feet. This might have had *some* effect upon reducing the excess of the consumption of fuel when compared with that which had taken place in the No. 1, and might have increased its power of smelting with my blast of a 1¾lb. upon the square inch pressure only, from its former average of 22 tons to 24. Since I have adopted the use of anthracite coal, combined with hot air, my make in the No. 2 cupola furnace, with the same pressure of blast only, has ranged from 30 to 34 and 36 tons, and one week we actually tapped within 3 cwt. of 39 tons of grey iron from this furnace. Its present weekly average may be expected to range from 35 to 36 tons.

"With respect to the quality of the iron produced by the combination of hot blast and anthracite coal, the result which I have to communicate will be very satisfactory. It is well known in my neighbourhood, that my cold blast iron, for all purposes where great strength was required, was never deemed inferior to any smelted in South Wales. *That which I have hitherto produced with hot blast* and anthracite coal, is, however, decidedly stronger than any other before smelted at the Ynyscedwin Iron Works. Relying upon the representations of chymists, that anthracite coal is almost entirely composed of pure carbon, I have always indulged the hope that, in the event of my ever succeeding in discovering a method of applying this fuel to smelting purposes, that I should be able to produce a quality of iron not very dissimilar to that formally obtained by smelting with charcoal. How far this expectation will be realized, further experience must prove; but as far as my experience of the quality of this particular description of iron up to the present time has gone, I am sanguine with respect to the result. I shall be happy at any time to offer every facility in my power to any parties who may be deputed by this Association, or by any other scientific body, to thoroughly investigate this important subject.

"The idea first occurred to me of applying an heated blast to anthracite coal thus:—One evening, after I had placed a piece of it upon my parlour fire (which had before been made up with bituminous coal) and had allowed it to arrive at a red heat, upon my applying as fierce a blast to this piece of coal as I could raise from a pair of bellows, I noticed the appearance of a black mark or spot, upon that part of it where the air impinged upon it; on my continuing the like rapid current in the same direction, I shortly blew the fire out of it. I at once perceived that the effect of the strength of the current of air, when cold, which we of necessity are obliged to blow into our furnaces, to secure the passage of the blast through the high and dense column of materials contained in an erection like a blast furnace, instead of encouraging ignition, was actually unfavourable to it. On giving the thing but a moment's reflection, the question promptly occurred to me—what would be the effect of turning a blast into a furnace upon this coal, which would itself burn, which would itself melt lead? I at once determined that it was a thought which was really worthy of mature reflection. The further consideration which I gave to the matter, and the further experiments which I shortly after instituted, which were continued at a great expence for some months, have at length been crowned with the full success which I have now had the pleasure of reporting to this meeting.

"The anthracite formation probably occupies about one-third of the mineral basin of South Wales. It commences near the upper part of the Vale of Neath, in the county of Glamorgan, and proceeds in a westwardly direction through the remainder of that

county; thence through that of Carmarthen, and crops out, as I am informed, in the sea in St. Bride's Bay, after passing through a considerable portion of the county of Pembroke. It is likewise to be found in Ireland, Scotland, France, Austria, Bohemia, and Sardinia, in the Old World, and very large deposits of it have been already discovered on the continent of America, particularly in the state of Pennsylvania."

PROPOSED PLAN FOR PROTECTING THE WORKS OF THE THAMES TUNNEL FROM IRRUPTIONS OF THE RIVER.

Sir,—I beg leave to suggest, through the pages of your valuable journal, a remedy for the dangers which now exist in carrying on the works of that ill-fated undertaking, the Thames Tunnel.

Let a raft, or deck, be constructed of massive timber, and caulked similar to a ship's deck; this raft must be 30 or 40 feet wider than the Tunnel, and sufficiently long to cover that part of the bed of the river immediately over the part of the Tunnel where operations are being carried on: by laying a sufficient weight upon the raft, it could be sunk and imbedded into the bottom of the river, so as to form, I think, a complete protection to the workmen underneath. The irruptions which have taken place proceed, I believe, from two causes; first, from the loose nature of the soil composing the bed of the river; and, secondly, from the immense pressure of the great body of water; the raft would undoubtedly counteract the evil of the pressure of water, and if sufficiently imbedded into the bottom of the river by heavy weights, would, I think, become sufficiently water-proof to enable the workmen to excavate to the bottom of the raft, if necessary, without the fear of inundation. When that part of the Tunnel was completed over which the raft was placed, it could be removed by the following simple means.

Let an iron ring be strongly inserted at each corner of the raft, at low water. Chains could be easily attached to these rings; then tightly moor a lighter to each chain; and as the tide rises, the raft would also rise, and could be easily lowered over that part of the Tunnel next in operation.

I am, Sir, &c.

J. S.

Grafton-street, Soho, Nov. 10, 1837.

CORNISH STEAM-ENGINE DUTY.

Sir,—Your correspondent, P. E., will be glad to be informed that it is impossible the Cornish engineers can be placed in the dilemma with their employers, which he has anticipated, since the latter have long since thought proper to place the management of their pumps under the care of the mine agents (or captains), to whom alone the pitmen are responsible; and further, the account of "work performed" is published monthly, under the direction of an agent employed by the mining adventurers, from data cautiously guarded from any interference on the part of the engineers.

As the charge openly made by Mr. Dickson against them has been repeated by another person calling himself a Practical Engineer, I deem it an act of justice to the Cornish engineers to point out to the notice of the public the parties who are responsible for the published statements of "work performed," to which alone I have referred. viz. the mining adventurers, and their agents, since the charge seems to have arisen, in consequence of the republication in the *Mechanics' Magazine* of my observations on steam used expansively.

The public have been so long accustomed to the concealment, arising from various causes, of the performances of steam-engines (with the exception of steam boats and locomotives (where the progress lately made is clearly due to the competition arising from publicity), that they seem unable to credit the statements made by the employers of the mining engineers, respecting the progressive improvements which have resulted in the course of twenty-three years, from an organized system of competition on known conditions. The propriety of these conditions may be fairly questioned, and the arguments adduced should tend to that point alone. It is not, however, my intention to enter upon the question of short strokes, large bushels of coal, drawing air from the upper lifts, water in fork, &c. &c., further than to observe, that it is the fault of the mining captains if the present average deficiency of the water delivery, exceeds that of any former period. My belief to the contrary is founded on my confidence in their greater skill, and in the greater attention now paid to the pitwork.

Parties ignorant of the methods of working and calculation adopted, are perhaps not aware, that their charge of deception in reference to reported duty, resolves itself into an assertion that the Cornish mining adventurers are ignorant of the amount of money paid for the drainage of their mines! It is obvious that the argument derived from the decrease of money now paid for the water charge (which is about in inverse proportion to the increase of reported duty) proves the general accuracy of their published statements of the comparative "work performed by steam-engines in Cornwall."

The words "idle curiosity" in my last letter (not intended as a defence of the Cornish engineers) referred to my inquiries several years ago respecting the difference between the actual and calculated delivery of water from the pumps. Such was the feeling evidently excited, although not expressed, by several mining adventurers, who seemed fully convinced that the present system of reporting duty was exceedingly well adapted for their purpose.

I would refer those of your readers who feel an interest respecting the 125 millions commented on by Mr. Perkins, in an American journal, to the report of the committee under whose superintendence the trials at Fowey Consols took place, inserted in the *Mechanics' Magazine* December, 1835, vol. xxiv., p. 197. The names of six pitmen from mines in the neighbourhood, are there given, who watched under ground, for the prevention of the admitted unfair trick, on which his argument depends. And, further, the weight of the imperial bushel of coal used is expressly stated to have been 94 lbs.; and of this excess above 84 lbs., I believe 4 lbs. are due to the imperial bushel, and 6 lbs. to the greater density of Welsh coal in comparison with Newcastle.

I am, Sir,
Yours respectfully,
JOHN S. ENYS.

Nov. 13, 1837.

HUTCHISON'S RETORT BEDS.

Sir,—I take the liberty of making the following remarks upon a letter in your last number signed Peter Pindar. Such *sweeping animadversions* upon the management of the generality of gas works, ought not to be indulged in without data, by which we may be enabled to judge of the superior economy used by Mr. Hutchison in the setting of his retorts. Far be it from me to detract from the merits of that gentleman; his credit as a man of talent cannot require the aid of such exparte statements as those put forth by his friend Peter Pindar. He ought in the first place, to have given the quantity of fuel (if coke, in bushels) requisite for the carbonization of a ton of coal, which is the only true estimate by which we can judge of economy in the working of retorts. To give the number of retorts in one bed is no proof whatever of the amount of coal carbonized; as some retorts are five times the size of others, and the quantity of fuel consumed in one furnace may be equal to five smaller.

At an establishment in the country where I have taken the average of a number of retorts, I have found the result as follows: fourteen bushels of coke and breeze are required to carbonize one ton of coal; at the same establishment where the rental is 8000*l*. per annum, the price of gas being 9*s*. per thousand cubic feet, with discount allowed down to 7*s*., according to the quantity consumed, the cost in coal last year, after deducting the receipts for the sale of coke was 2095*l*.

The charge which this writer brings against the Brighton Gas Company, should have been supported by a statement of the quantity of gas produced, or the income of the company.

I am, Sir,
Your obediently,
R. Y.

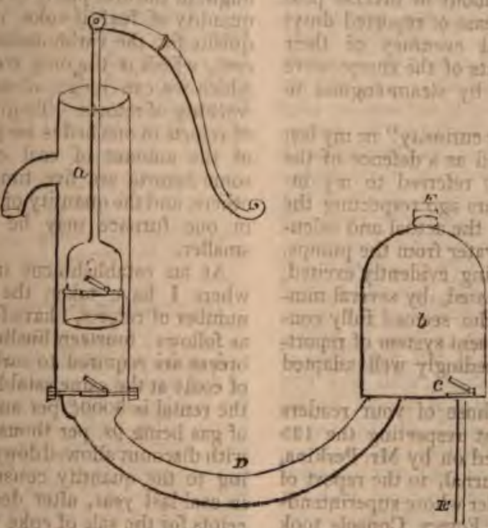
November 21, 1837.

WILLIAMS'S TREFFOS PUMP.

Sir,—From the discussion, and remarks elicited at the exhibition of the above invention by Mr. Vignoles, at the British Association Meeting, (an abstract of which you have published, page 447, of your September number,) I am induced at the suggestion of Mr. T. Webster, Secretary of the Institution of Civil Engineers, and other gentlemen that took part in the discussion of its merits, to record the objections that I then made to it, so as to leave its merits open, as an improvement on the common pump,

to the inspection of persons more competent to pronounce an opinion than I am. I therefore subjoin a drawing of the pump, as shown at the Section, so that your scientific readers may be put in possession of the invention.

It is in every respect precisely the same as the common pump, with the exception of the intervention of what the inventor designated a "treffos;" and this consists of a metal vessel, or chamber, adjacent to, and of somewhat larger dimensions than the barrel, or working part of the pump, to the bottom of which it is connected by a pipe, as well as to the suction pipe in the well, which pipe is inserted into the bottom of the treffos, to which is attached a valve on the inside, in all respects similar to the two valves or boxes of the working barrel as under.



a, The working barrel; *b*, the treffos; *c*, the valve in it leading from the suction or well pipe E; D, the pipe connecting the treffos with the working barrel; F, an air tight cap, that screws on or off the treffos. What is proposed (the inventor states,) by this pump is, to keep up a continuous motion in the column however long, and thus permitting the pump to be placed in the most convenient position; likewise, to save the power by which a long column of water is set in motion a-fresh at each stroke of the pump, and to save expense, in the dimensions of the supply pipe, and by keeping up the continuity of the action, a purpose hitherto attained imperfectly by the size of two or more cylinders, which are inapplicable to the purposes of the common house pump. The operation (Mr. Williams says) is this: the treffos is to be quite filled with water in the first instance through the cap F, and to be completely closed when the pump is *set in motion*. As the piston ascends, the water below rises in the working barrel, and falls in the treffos until the water is on a level in each, there being no atmospheric pressure on either, which will equalize the current, and be the means of obtaining the working barrel full at each stroke, so as to render the piston independent of the supply pipe, but dependant on the larger vessel; at the same time very much lessening the expense, by employing pipe of ⅜th of an inch, instead of the usual bore for the well, &c.

This idea, I consider fallacious, (and as I stated to the Section) rather disadvantageous, than otherwise: we will assume the barrel to be a 4-inch lead one, to which I believe most practical plumbers would annex a pipe of 1¾-inch or 2-inch bore, as the suction or well pipe; which size, further suppose, the inventor would himself employ from the treffos to the working barrel, (a distance of only a few feet), and here pipe of the usual bore is to end, to give way to the im-

proved method of attaching pipe of ¾-inch bore; suppose the pump piston to be put in motion, how much water shall we get into the barrel after perhaps the first stroke, or when the water has attained a level in the two vessels? As much only as a pipe of ¾-inch bore can give it. What is the consequence? At each stroke of the handle you have to sustain a column of the atmosphere, equal to the area of the barrel, namely, 4-inches in diameter; of which we attempt to neutralize the effect, by as much water as a ¾-inch pipe will supply on the other side of the piston bucket. Yes, but we have a reserve supply in the treffos, (say those who are favourable to the invention. Certainly not; for as the treffos is perfectly air tight, there can be no atmospheric pressure upon the surface of the water within, and consequently none will be coaxed up the working barrel to the spout, except as I before stated, as much as the small ¾-inch well pipe will supply with the above enormous atmospheric pressure upon the handle. Again, the pump-maker will tell you, that if pumps could be made with but one valve instead of two, it would be an invaluable improvement, as the valves occasion all the trouble that can take place for some years, after a good pump is once well put up; but we must not look for this improvement in Mr. Williams's, as he employsno less than three valves, the disadvantage of which, must I am sure be obvious.

In respect to the economy of employing the well pipe of small bore, must the inventor not allow a sum quite as large for the treffos, with its air-tight metal screw cap and valve, as the large pipe would cost? And, as to the duty such a pump would do, compared with one constructed in the usual way, and of the usual dimensions, it would be in the proportion of two pumps, of 4 inch barrel each, one with a ¾th inch suction pipe, the other with a 2 inch suction pipe; which, with taking the friction into account, will give a great disparity, besides the additional apparatus, called a treffos.

As to the continual current, or stream of water, in the common pump you always have a column of water following the upper box, ready to be delivered through it, by resting on the lower box, whenever the down stroke of the piston takes place; you can have no more by Mr. William's pump, even supposing it to have every advantage he designed it to have.

The above is the substance of the objections I made, which were I believe assented to (if I may judge by their nods of approval from the rostrum), by Dr. Lardner, Mr. Vignoles, Mr. Webster, and other gentlemen of the committee; but if any of your scientific friends think otherwise, I should be glad to be favoured with their views through your very valuable work, particularly the opinion of your talented correspondent, Mr. Baddeley, (for, agreeable to the association of ideas), I never think of fire or water, but I think of him.

I remain,

Your very obedient servant,

RICHARD EVANS.

8, Castle-street, Swansea,
Nov. 15, 1837.

ALEXANDER'S ELECTRIC TELEGRAPH.

(From the *Scotsman*.)

A model to illustrate the nature and powers of this machine, was exhibited on Wednesday evening, at the Society of Arts in Edinburgh. The model consists of a wooden chest about five feet long, three feet wide, three feet deep at the one end, and one foot at the other. The width and depth in this model are those which would probably be found suitable in a working machine; but it will be understood that the length in the machine may be a hundred or a thousand miles, and is limited to five feet in the model merely for convenience. Thirty copper wires extend from end to end of the chest, and are kept apart from each other. At one end (which, for distinction's sake, we shall call the *south* end) they are fastened to a horizontal line of wooden keys, precisely similar to those of a piano-forte; at the other, or *north* end, they terminate close to thirty small apertures equally distributed in six rows of five each, over a screen of three feet square which forms the end of the chest. Under these apertures on the outside, are painted in black paint upon a white ground, the twenty-six letters of the alphabet, with the necessary points, the colon, semicolon, and full point, and an asterisk to denote the termination of a word. The letters occupy spaces about an inch square. The wooden keys at the other end have also the letters of the alphabet painted on them in the usual order. The wires serve merely for communication, and we shall now describe the apparatus by which they work.

This consists at the south end of a pair of plates, zinc and copper, forming a galvanic trough, placed under the keys; and at the north end of thirty steel magnets, about four inches long, placed close behind the letters painted on the screen. The magnets move horizontally on axes, and are poised within a flat ring of copper wire, formed of the ends of the communicating wires. On their north ends they carry small square bits of black paper, which project in front of the screen, and serve, as *opercula* or *covers* to conceal the letters. When any wire is put in communication with the trough at the south end, the galvanic influence is instantly transmitted to the north end; and in accordance with a well-known law discovered by Oersted, the magnet at the end of that wire instantly turns round to the right or left, bearing with it the *operculum* of black paper, and unveiling a letter. When the key, A, for instance is pressed down with the finger at the south end, the wire attached to it is immediately put in communication with the trough; and at the same instant the letter A at the north end is unveiled, by the magnet turning to the right, and withdrawing the *operculum*. When the finger is removed from the key, it springs back to its place: the communication with the trough ceases; the magnet resumes its position, and the letter is again covered.

Thus by pressing down with the finger, in succession, the keys corresponding to any word or name, we have the letters forming that word or name exhibited at the other end—the name Victoria for instance, which was the maiden effort of the telegraph on Wednesday evening. In the same way, we may transmit a communication of any length, using an asterisk or cross, to mark the division of one word from another, and the comma, semicolon, or full point, to mark breaks in a sentence, or its close. No proper experiment was made while we were present, to determine the time necessary for this species of communication; but we have reason to believe, that the letters might be exhibited almost as rapidly as a compositor could set them up in types. Even one-half or one-third of this speed, however, would answer perfectly well.

Galvanism, it is well known, requires a complete circuit for its operation. You must not only carry a wire to the place you mean to communicate with; but you must bring it back again to the trough. Aware of this, our first impression was, that each letter and mark would require two wires, and the machine in these circumstances having sixty wires instead of thirty, its bulk and the complication of its parts would have been much increased. This difficulty has been obviated, however, by a simple and happy contrivance. Instead of the *return* wires extending from the magnet back to the keys, they are cut short at the distance of three inches from the magnet, and all join a transverse copper rod, from which a single wire passes back to the trough, and serves for the whole letters. The telegraph, in this way, requires only thirty-one wires. We may also mention, that the communication between the keys and the trough is made by a long narrow basin filled with mercury, into which the end of the wire is plunged when the key is pressed down with the finger.

The telegraph, thus constructed, operates with ease and accuracy, as many gentlemen can witness. The term *model*, which we have employed, is in some respects a misnomer. It is the actual machine, with all its essential parts, and merely circumscribed as to *length* by the necessity of keeping it in a room of limited dimensions. While many are laying claim to the invention, to Mr. Alexander belongs the honour of first following out the principle into all its details, meeting every difficulty, completing a definite plan, and showing it in operation. About twenty gentlemen, including some of the most eminent men of science in Edinburgh, have subscribed a memorial stating their high opinion of the merits of the invention, and expressing their readiness to act as a committee for conducting experiments upon a greater scale, in order fully to test its practicability. This ought to be a public concern. A machine which would repeat in Edinburgh words spoken in London, three or four minutes after they were uttered, and continue the communication for any length of time, by night or by day, and with the rapidity which has been described—such a machine reveals a new power, whose stupendous effects upon society no effort of the most vigorous imagination can anticipate.

AMERICAN RAILROADS.

A singular and wonderful feature of America is her vast and increasing extent of railroads. While the English have almost stood still, contemplating with great complacency the two or three which they have made, the Americans have laid down two thousand miles of railroads, many of them as good for all practical purposes as the Liverpool and Manchester. Many circumstances conspire to assist the Americans in the construction of these roads—the alluvial plains, which often present a dead level for a hundred miles together, the great plenty of timber, and, more than all, the non-appropriation of the ground, which enables the projectors to buy it for a trifle, and, in the majority of cases, to get it for nothing. They have

pushed these roads into the very bosom of the wilderness. Like the military roads of the Romans, they hold steadily and straight on through plain and morass, through lane, forest, and river, and across the rugged Alleghanies, and the wild woods that skirt the banks of the Mohawk; and where a few years since an Indian hunter could scarcely force his way, you now dash along at the fearful velocity of twenty miles an hour. Many of these roads have been finished for less than 5000 dollars a mile; the very best of them made of English iron, and laid down on stone sleepers, have been completed for 29,000 dollars a mile, or about 6000*l*., which is only one-seventh the cost of the Liverpool and Manchester. The same method and dexterity which marks their steam-boat travelling, is also seen here: the engines are nearly all of American construction, having superseded those imported from England, and the engineers seem to have them under better control. There is certainly no unnecessary expense about these railroads. The sleepers are often not filled up, and frequently, in passing a deep chasm, or rushing torrent, the bridge is only just wide enough for the rails. Most of these railroads are at present single tracks, which occasion delay when trains meet. The carriages are larger than ours, they are sometimes fifty feet long, and have a deck with verandas. I have often remarked, that American engineers seem more dextrous than English. I have seen a train going seventeen miles an hour stopped in forty yards. The engine carries a large shovel in front, which removes any obstacle lying on the rail. Riding on the engines of a Washington train at night, I saw a cow lying on the rails; before I could exclaim, we were upon her, and I expected a shock, instead of which, the shovel picked her up, carried her a few yards, and then threw her to the roadside, out of the way. I took many opportunities of riding on the engines—wood is burned in most of them—anthracite coal in few. Their cylinders are mostly horizontal, like our own; but I saw several where the cylinders were vertical. There is a fine road from Albany, on the Hudson, to Utica, ninety miles. This road in a few months will reach to Buffalo, on the lake Erie, and then a traveller may pass from New York to Niagara, in twenty-four hours. There are railroads throughout all the New England States to every town of importance, and some thousand miles in progress in the South and West. There is the least improvement in the slave States. There is no country where you can cross such vast tracts in so short a time as in America, and the facilities are every day *increasing*. *The Ohio* already joins the Delaware, by a railroad 350 miles long, and in a few years, a traveller may be able to pass from the Gulf of Newfoundland to the Gulf of Mexico—from icebergs to orange-groves—in six days.—*Leicester Mercury*.

DESCRIPTION OF THE MOST POWERFUL ELECTRO-MAGNET YET CONSTRUCTED. BY THE REV. N. J. CALLAN, PROFESSOR OF NATURAL PHILOSOPHY IN THE R. C. COLLEGE, MAYNOOTH.

(From Sturgeon's *Annals of Electricity* for July).

I have lately constructed for the College, an electro-magnet which far surpasses in electric and magnetic power, all the electro-magnets of which I have been able to find a description. The iron bar of our magnet weighs 15 stone; it is 2½ inches in diameter, and more than 13 feet in length. It is bent into the form of a horse-shoe: the distance between the poles is 7 inches. A copper wire, one-sixth of an inch diameter, is coiled once round the whole length of the iron bar. This wire is divided into seven parts, each about 70 feet long. A thin copper wire, about one-fortieth of an inch in diameter, is soldered to one of the thick wires at about a foot from one of its extremities. The thin wire is about 10,000 feet long; it is wound round the magnet in the same direction as the thick wire, and in one continuous coil. By connecting the opposite ends of the seven thick wires with the opposite poles of a powerful galvanic battery, an extraordinary magnetic power is communicated to the iron bar; and, by breaking battery communication, an electric current of enormous intensity is excited in the long coil of thin wire. I have tried the magnetic and electric powers of this magnet only once. In consequence of making the trial, in presence of about 300 of the students, I was compelled to omit many of the experiments which I intended to make, and which I expect to make before the end of this month.

In exhibiting the power of the magnet, I first used our large battery of 20 pairs of plates, each 2 feet square, and afterwards a Wollaston battery, containing 280 pairs of 4-inch plates. When the opposite extremities of the seven thick wires were connected with the opposite ends of the battery of large or of small plates, we found it impossible to separate the keeper from the magnet by any force acting in a direction opposite to that in which the magnetic power was exerted. The keeper was a horse-shoe bar of iron about 20 inches long and 2½ inches diameter. The highest point of the arc formed by the keeper was 7 inches. The distance between its poles was the

same as the distance between the poles of the electro-magnet. Its weight was about 28 pounds. When the electro-magnet was placed in a horizontal position, and the keeper applied to it, the magnetic power was so great (when the battery of large plates was employed) that the keeper remained without any support, in a horizontal position; and, a weight of about 40 pounds, acting at 7 inches from the poles, or at the highest point of the curve formed by the keeper, was required to turn it out of the horizontal position. The poles of the magnet were so badly ground, that a great part of the keeper was at a sensible distance from the magnet.

The magnetic power produced by the 20 large plates was considerably greater than that which was communicated to the iron bar, by the 210 pairs of small plates.

The great electric power of the magnet, or its power of exciting an electric current in the helix at the moment battery connexion is broken, was shown by the most brilliant combustion of charcoal, and by the destruction of animal life.

To one end of the oscillating wire belonging to the electro-magnetic repeater, I tied with a fine metallic wire, a piece of charcoal, in such a way that, on working the repeater, the extremity of the wire and the point of the charcoal should dip simultaneously into the mercury, and should rise simultaneously from it. The opposite ends of the thick wires coiled on the electro-magnet were connected with the opposite ends of our large battery, and the connexion was broken very rapidly by means of the electro-magnetic repeater. As often as the connexion was broken, the charcoal and mercury were ignited by the electric current excited in the thick wires coiled round the magnet. The succession of sparks produced by the ignition of charcoal and mercury was so rapid, that they formed one continuous blaze of the most vivid light. The combustion of the charcoal and mercury was accompanied by a large quantity of smoke, and was much more brilliant than that which is produced by a voltaic current passed from the battery employed, through a pair of charcoal points.

When, by means of an electro-magnetic repeater, a rapid succession of the electro currents excited in the long coil of thin wire (at the moment of breaking battery connexion) was passed through charcoal points, they were but slightly ignited. But, although the igniting power of the electric current produced in the long coil of thin wire, was very feeble, its intensity was exceedingly great. For, when it was passed through the body of a large fowl, instant *death was produced.*

I have not as yet examined the decomposing power of our magnet; but I will shortly try it on some of the simple substances.

I found about four months ago, than an electric current capable of giving a shock, and consequently of producing decomposition, is excited in the helix of an electro-magnet on making, as well as on breaking battery connexion, when the thick wire coiled on the iron bar is short, and when the thin wire is long. Hence it is impossible to obtain separately the elements of bodies decomposed by the electro-magnet. For a similar reason, it appears to me impossible to obtain separately the elements of substances decamposed by the magneto-electric machine. The shock given by the magnetic helix, on *making* battery connexion is weak compared with that which is given, on *breaking* communication. It increases with the number of plates in the battery.

I am now engaged in making an electro-magnetic engine to be worked by our large magnet, or by 26 smaller electro-magnets. Should the engine work well, I expect to send you a description of it, in time for publication in the October number of the Annals.

N. Callan.

Maynooth College, June 14, 1836.

ON THE METHOD OF CONNECTING ELECTRO-MAGNETS SO AS TO COMBINE THEIR ELECTRIC POWERS, ETC.; AND ON THE APPLICATION OF ELECTRO-MAGNETISM TO THE WORKING OF MACHINES. BY THE REV. N. J. CALLAN.

(From Sturgeon's *Annals of Electricity* for October.)

About four months ago, a method occurred to me, by which any number of electro-magnets might be connected together so as to obtain an electric current, having an intensity equal to the sum of the intensities of all the currents excited in the helices of all the magnets. I tested this method by experiment about a month ago, and found it successful. I coiled on two bars of iron, once round their entire length, a copper wire one-twelfth of an inch diameter, and left the ends of the wire on each bar, projecting. I then coiled about 150 feet of wire one-ninetieth of an inch diameter, over the thick wire. The ends of the thin wire on each bar were also left projecting. The ends of the thick wire on each bar were successively connected with a pair of seven-inch plates, and the shock taken from the thin wire, of each magnet, by holding a pair of cylinders connected with their extremities of the wires. The shocks from the two magnets appeared to be equally strong. Afterwards the thin

wires of the two magnets were united at one of their extremities so as to form one continuous wire, and the voltaic current was passed from the same pair of plates, through the thick wire coiled on both magnets. The shock given by the thin wire, in this case, (on breaking battery connexion) appeared to be twice as strong as the shocks given by either of the magnets seperately. Hence, if the thin wires coiled on any number of electro-magnets, be united together so as to form one continuous wire; and, if all the magnets be simultaneously magnetized by the voltaic battery, an electric current will be produced in the thin wire (at the moment of breaking battery communication) having an intensity equal, or nearly equal to the sum of the intensities of the currents excited in each of the helices. Care must be taken to unite the thin wires in such a manner, that the electric current excited in the helix of each magnet on breaking battery communication, may all flow in the same direction; otherwise, the current produced in the helix of one magnet may neutralize the current excited in the helix of another. From a small electro-magnet, an electric current equal in point of intensity to that of a battery containing 1,000 or 2,000 voltaic circles, may be readily obtained. Hence, by means of 100 electro-magnets, and a battery containing 10 or 12 large plates, we may produce an electric current equal in point of intensity to that of a battery containing 100,000 or 200,000 pairs of plates. An electric current of enormous intensity may be also obtained from a single magnet of very large size. But, I am strongly inclined to think that the electric power of 100 small magnets is considerably greater than that of a single magnet equal in size to the 100 magnets. First, because all long bars retain a considerable portion of the magnetic power imparted to them by the voltaic current. I have tried about fifteen bars of iron, varying in length from 6 to 13 feet, and every one of them retains some of the magnetic power. Our large electro-magnet retains constantly a power capable of lifting about twenty pounds. Secondly, because long bars lose their magnetism, slowly and not in an instant.

Any number of electro-magnets for electrical purposes, may be united so as to increase those effects which depend on quantity of electricity. If the similar ends of all the thin wires coiled on the magnets be connected together, while the similar ends of the thick wires belonging to the magnets are connected with the battery, as many electric currents will (at the moment of *making* and of *breaking* battery cammunications) be excited in the thin wires as there are magnets, and will pass through any body placed between the ends of these wires.

I have just made an electro-magnet which, with a single pair of 7 inch plates, gives (even at the moment of making battery communication) a shock as strong as the shock from about thirty ar forty pairs of plates.

In making electro-magnets which are to be connected for the purpese of obtaining increased electric intensity, care must be taken not to solder the thin to the thick wires of the magnets, and to leave both ends of the thin wires projecting.*

About four month ago I coiled on a cylinder of wood about 10 feet of covered copper wire one-eighth of an inch thick. Over this wire, I coiled about 200 feet of very thin wire which was also covered. When the ends of the thick weke were connected with a pair of plates, a shock was received by holding in the hands a pair of cylinders connected with the ends of the thin wire. This shock was felt only at the moment of making battery communication, but not on breaking the communication. When the voltaic current was passed through the thick wire from a battery of 20 pairs of 2 feet plates, there was no shock on breaking communication, but, on making communication, the shock was very strong. The electric current which gave the shock was incapable of producing any effect on a very delicate galvanometer. When an iron bar was put into the helix formed of the thick wire, the shock felt on making communication was greatly increased, but was far weaker than the shock received on breaking communication.

In a paper published in the July number of the Annals, I stated that I was then employed in making an electro-magnetic engine to be worked by 26 electro-magnets. In the end of June, I tried the engine before it was completed, and found these two defects in it. The first was that some of the magnets were connected by iron where they ought to have been connected by a substance not susceptible of magnetism; the second arose from the number of magnets which were divided into two sets, each containing 13 magnets. I found it impossible, in the plan which I adopted, to make an odd number of magnets work, and was therefore

* For the illustration of secondary currents at the lecture table, I find no method so simple and explanatory, as by having two *distinct coils*, each on its own bobbin. The battery coil of thick bell wire is on the smaller bobbin, and can be introduced to the interior of the thin wire coil at pleasure; the bobbin of the latter having a hollow axis sufficiently large for its admission. By this means it is obvious to every auditor, that the battery current has no communication with the outer coil. EDIT. ANNALS OF ELEC.

obliged to reduce the number of magnets to 24: or to two sets each containing 12 magnets. I also substituted a brass connexion between the magnets for the iron one. I then found that one small electro-magnet was capable of producing circular motion in a wheel which weighed about 100 pounds, and that six magnets were sufficient to give rapid motion to the wheel. The results of the experiments which I made, convinced me that electro-magnetism might be successfully applied to the working of machinery of every kind, and I resolved to get made an engine which would do the work of one horse or perhaps of two. This engine will contain 40 electro-magnets, and I expect that, with a battery containing 6 square feet of zinc, it will propel, at the rate of seven or eight miles an hour, a carriage which along with its load, will weigh 13 cwt. The engine will be ready for work in the end of this month or in the beginning of the next. By calculations founded on experiment, I have been led to the following conclusions. First, that an electro-magnetic engine as powerful as any of the steam engines on the Kingstown Railway, may be constructed for the sum of 250*l.*; secondly, that the weight of such an engine will not exceed two tons; thirdly, that the annual expense of working and repairing it will not be more than 300*l.* If my calculations be correct, the expense of propelling the railway carriages by electro-magnetism, will be scarcely one fourth of the cost of steam. I have found that the first cost of an electro-magnetic engine, and the expense of working and repairing it, increase only as the square root of the power of the engine. Thus, the first cost of an engine of 100 horse power, and expense of working it will be very little more than ten times the cost of an engine of one horse power. A battery containing 10 square feet of zinc will work an engine 100 times as powerful as that which requires only one square foot of zinc.

N. J. Callan.

Maynooth College, September 11, 1837.

WHISHAW'S HYDRAULIC TELEGRAPH.

We have long ago heard it suggested, and we think by Mr. Vallance, that a column of water could be conveniently employed to transmit information. Mr. Francis Whishaw has conveyed a column of water through sixty yards of pipe in the most convoluted form, and the two ends of the column being on a level, motion is no sooner given to one end than it is communicated through the whole sixty yards to the other end of the column. No perceptible interval elapses between the time of impressing motion on one end of the column and communicating it to the other. To each end of a column he attaches a float board with an index, and depression of any given number of figures on one index, will be immediately followed by a corresponding rise of the float board and index at the other end. It is supposed that this simple longitudinal motion can be made to convey all kinds of information. It appears to us that the amount of information which can be conveyed by the motion in one direction only, of the water, or backward and forward, must be limited. To make the mere motion backwarks and forwards of a float board, indicated on a graduated index, convey a great number of words or letters, is the difficulty to be overcome. Mr. Whishaw has exerted his ingenuity in this way, with a promise of success, and by-and-bye, the hydraulic telegraph may supersede the semaphore and the galvanic telegraph.—*Courier*.

THE CUBA RAILWAY.

We have been furnished by a correspondent with the following account of the railway which has been constructed across the island of Cuba by the government of that island, and which is about to be completed and opened in a very short time:—

This railway passes from the city of Havannah to the port of Batabano, on the southern side of the island of Cuba, and is eighty miles in length. The purpose for which it has been constructed, is to connect the commerce of the Havannah and the northern side of the island, and also the commerce of New Orleans and various other important parts of the northern side of the Gulf of Mexico, with the West India islands and the Spanish Main. Cuba being an island of upwards of 700 miles in length, but only about 80 miles in its average breadth, and lying in a position which requires vessels from the north or the south to sail round it in order to reach the opposite sea, it was projected by the present governor of the island, that a railway should be formed for the purpose of cutting off a navigation of several days, by passing across the island from north to south. It is therefore apparent that the railway is a work of the most important kind, and will tend to improve most materially the commerce, not of the island of Cuba alone, but of the English West India islands, and of all the countries of the West India seas.

The railway is not perfectly direct in its course from the Havannah to Batabano; as, in the commencement of the undertaking, it was thought expedient to carry the line a few miles eastward of the due course across the

island, for the purpose of taking in some very rich and populous villages and sugar plantations which exist upon the way. This deviation, however, will serve as a branch, should the traffic upon the railway prove equal to the expectations of the government, and the course, at a future time, be required to be rendered perfectly direct from sea to sea.

Fifty miles of the line have been completed some months since, and a steam locomotive engine, of great power and size, has been mannfactured for it, by the Messrs. Braithwaite, of the New Road. The whole of the levels and other more important works upon the remaining thirty miles, are now also completed; and the rails having been shipped from England about two months since, it is expected that the next arrivals from the Havannah will communithe intelligence of the opening of the entire line.

Seeing that a railway of so great a magnitude is thus about to be completed, in so comparatively improbable a situation as the island of Cuba, let us hope that the governments of the neighbouring English West India Islands will profit by the spirited example of the Spaniards, and proceed to construct similar works in many localities amongst the islands, where outlays of money for such purposes would be much more certain of being repaid than in any of the colonies of Spain.—*Railway Times.*

NOTES AND NOTICES.

German Railroads.—The operations on the Leipzig and Dresden railroad have been carrying on with great vigour, but it remains to be seen whether they will be affected by the sudden disappearance of the secretary, Mr. Tenner, who, since the beginning of the present month has vanished. During September, the number of labourers employed on the works was no less than 5887. The line is open from Leipzig to Althen, and during September, the number of passengers, on twenty-two travelling days, and in 198 journeys, amounted to 16,577 persons from Leipzig to Althen; and 15,597 persons from Althen to Leipzig, altogether 32,174 persons. Up to the 30th September, there had altogether been 94 travelling days, and 802 journeys, and 100,655 persons had been conveyed both ways. The locomotives have arrived in readiness for the Potsdam railway, but it is said, that competent judges affirm that whatever exertions may be made, at whatever expense, it will not be ready to open in less than three years.

East Indian Caoutchouc.—It is well known that a large supply of this valuable substance might be procured from India, if the same care were to be
taken in gathering it as in South America.
London Caoutchouc Company," impressed
idea, accordingly sent to India an offer of a
of fifty pounds for the first hundred weight
India caoutchouc which should be ship
England. When the offer arrived, howeve
somewhat of the latest; the great demand
at home for the article had been previous
of, and large quantities were already on sh
compared to which the "hundred weigh
lated for was but a molehill to a mountain
whole affair forms an apt illustration of the
that, in commerce, the force of self-intere
superior to that of artificial bounties.

Specimen of French Invention.—Among
joint-stock companies which are starting
and threefold in the French capital, ther
of rather a more novel character than usua
is a "Navigation Company," which pro
introduce into France those improved me
communication in which, as the prospectus o
she is far behind many other countries, but
pecially England and America: to effect
ject, or even to go beyond it, it is proposed
a number of steam-towing vessels, some o
size for the open sea, and others of sma
mensions for the French rivers, with an i
fleet of ships and barges to be prop
the former. The grand feature of the sc
that these vessels are to be so constructe
serve the purposes of conveyance by land as
by water: the towing ships, when required
mount the railways as locomotives, while th
voy are to follow in the character of a "trai
worst of the matter is, thst the projector
plan do not point out in what way the n
metamorphosis is to be effected: they
themselves with dwelling on the great and nu
advantages of their scheme, but do not so fa
descend upon particulars" as to give even
ling of the method of putting it in practice.
appear to have been too well satisfied w
brilliancy of the idea, to trouble themselve
least as to the practical details. Their pro
is headed with a wood-cut representing a c
steam-vessels, with nothing remarkable abou
towing along a number of boats and barg
underneath the public are informed that
to do duty by land as well as water,—but th
The projectors probably think it will
enough to have their vehicles ready for the ra
when the railroads in France are ready for
Meanwhile, provided they can raise sufficie
tal, they propose forthwith to commence op
by starting a line of boats on the Upper Sein
Champagne to the capital, and another on th
Seine, from Paris to Rouen, as well as a
from Havre (to begin with) to London, A
and Amsterdam. The foreign vessels are i
to set out three times a month, and the d
every other day. There is no doubt, whate
be the fate of the present project, that the i
ment of internal communication, especiall
agency of steam, is daily making a rapid pro
almost every part of France.

London and Brighton Railway without a
—We understand the original Shareholders
line have given the requisite notices of thei
tion to apply to Parliament this session;
after all, there appears some probability t
long-contested question will again be agi
—*Railway Times.*

LONDON: Printed and Published for the Proprietor, by W. A. Robertson, at the Mechanics' M *Office, No. 6,* Peterborough-court, between 135 and 136, Fleet-street.—Sold by A. & W. Galign *Vivienne, Paris.*

Mechanics' Magazine,

MUSEUM, REGISTER, JOURNAL, AND GAZETTE.

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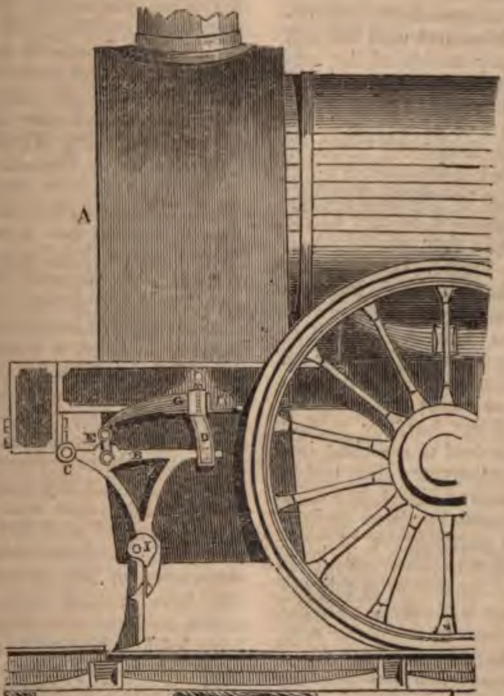
HAWTHORN'S PATENT RAILWAY PROTECTOR.



HAWTHORN'S PATENT RAILWAY PROTECTOR.

To clear the rails from impediments is of the utmost consequence in railway communication. With the railway protector affixed to locomotive engines now in general use, a necessity exists of keeping it about two inches *above* the rail. This is a matter of regret, inasmuch as the efficiency of the protector in the removal of dangerous impediments, accidentally or designedly laid in the track of the engine, is thereby greatly depreciated. The reason for allowing two inches between the protector and the line of road is obvious. The protector being firmly fixed to the engine, that space is necessary to prevent the appendage from coming in dangerous contact with the rail, from the undulatory motion of the machine, often increased by irregularities of the railway; and is case of a close proximity between the line of way and the protector, in those occasional instances where the end of a rail has started up at a joint, or in passing the points of a crossing, the appendage now in use, so far from conducing to safety, would absolutely increase the danger. It is therefore desirable that some plan should be adopted, which, whilst it is made to run so close to the rail as to sweep off *small* as well *bulky* substances, will give way on coming in collision with such impediments as cannot, or ought not to be removed. The subject has, by several engineers, been deemed of sufficient importance to engage their attention, and to accomplish the desired object, the after described arrangment has been designed, and recently patented by Mr. W. Hawthorn, of Forth, Newcastle. It will be seen that a protector on this arrangment could not be firmly fixed to the frame of the engine; it is, on the contrary, connected to it by a joint, with a spring pressure upon it, thereby enabling it to move back and rise when it may chance to come in contact with such an object as started rail, as shown in the sketch. When such object is passed, the action of the spring would immediately place the protector in its former position, and enable it to remove from the rail all loose substances.

Explanation of the Engraving.

A is the-front end of a locomotive engine; B the protector, connected to the frame of the engine, by the joint C, on which it works; D is a guide for the back part of the protector to slide in; G a steel spring connected to the protector by the link E, by which it is pressed down with a force requisite to give to it a sufficient firmness to remove any loose obstruction from the rails; I is a joint in the protector, by which it clears any impediment when the engine is moving backwards.

ETTRICK'S IMPROVEMENTS IN THE MARINER'S COMPASS—ARTIFICIAL HORIZON, ETC.

Sir,—With a few solitary exceptions, the attempts at improvements on nautical apparatus, promulgated by landsmen, are altogether worthless; and this arises not so much from a want of ingenuity in the projectors, as from a total absence of that familiarity with the seamen's business and habits, which can alone lead to a right understanding of real deficiencies.

Of this truth, abundant proof might be gleaned from the pages of the *Mechanics' Magazine*, but what more immediately directs my attention to it at present is, the drawing and description of "Ettrick's Improved Mariner's Compass," which appeared in your 737th number. By this instrument the inventor proposes to effect a mechanical correction of the magnetic variation, and he sets out with an expression of surprise, almost amounting to scepticism, that the old compass should have been so long used, not only in the merchant service, but also in the royal navy; now, one would think, that that very circumstance, coupled with the fact that such a very simple alteration had escaped the penetration of Mr. Barlow, and others, who have devoted such close attention to the subjects, would on the contrary, have led Mr. Ettrick rather to distrust the *utility of his project*.

Mr. Ettrick evidently supposes that the correction for variation is made by the helmsman in the act of steering; for upon this supposition alone, could the proposed alteration be useful: but this is *never the case*, the steersman need know no more of variation than the wheel in his hand, he keeps a course according to the orders he receives from his superior, and in the determining of that course many elements of correction must be taken into consideration, such as currents, lee-way, &c., the simplest of all

ch, and the easiest applied, is the
on of the compass.
ever, a good seaman never refers
pers point, and seldom to the com-
he steers nearly altogether by the
external objects; and when he does
at the card, the fore and aft line,
ay so express it, which long habit
pressed upon his mind, is sufficient
sfy him of the correctness of his
. The improvement suggested by
ttrick, so far from adding to the
n's correctness, would materially
ger it, for it would entail upon him
cessity of unlearning all his previ-
perience, the very thing in fact
at present constitutes his expert-
As for the proposal of colouring
ints, to enable *the seaman* to dis-
h them, I shall not trust myself
e a single remark upon it.
ther nautical improvement ema-
from the same inventor, has called
some judicious observations from
addeley at page 433: but Mr.
ley is wrong in attributing to Mr.
od the merit of having "intro-
' the floating speculum horizon.
ry, and other fluids, occasionally
ed by a floating glass-cover, have
n use time out of mind; and Mr.
ley will find the particular one in
n, alluded to in Barlow's Mathe-
l Dictionary, under the article
drant," published a quarter of a
y since. It is, indeed, almost
ible to turn over the leaves of any
ientific book, without being fully
ced of the truth of Solomon's
. In a late communication I
ned at random, that Clarke's
blower was a hundred years old,
rence since, I find that the patent
ken out in 1834, and that the
wherein Dr. Desaguliers intro-
it to the Royal Society under the
ppropriate name of "His Centri-
Bellows for forcing or exhausting
as read before the Society in the
735!

I remain,
Your very obedient,
NAUTILUS.

SPECTS OF LOCOMOTION ON COMMON-ROADS.

—I am desirous of offering a few
rs to the public, through the me-dium of your useful and widely circulated Magazine, upon a subject which in this age of railways, has, it appears to me, been unduly lost sight of—I allude to steam carriages on common roads. I am not ignorant of the nature of the difficulties which the ingenious men who have devoted their time, money, and talents, to this undertaking have had to contend against; but, I maintain, that those difficulties are not insuperable.

There is a proverb, which says, that "the pitcher goes many times to the well, but comes home broken at last;" just so, in an inverse order, it is, and ever has been, in mechanical improvements and inventions; there are many attempts, many failures, many disappointments, but at each step some little experience is gained, some slight improvement is made; by slow degrees the piece of art progresses towards perfection, until at length it starts freely off into active life, and goes on its way triumphantly. Thus it was with the steam-vessel: whilst William Symington, John Fitch, Henry Bell, and Robert Fulton were experimenting, the wise ones sneered at their efforts. The "prudent men regretted to see much valuable time and property wasted upon a wild and visionary scheme." And now what do we see? Steam-vessels navigating almost every sea, lake, and river of the earth: and yet I am justified in saying, that steam navigation is only in its infancy. So it has been also with railways. Railways have been in existence for ages; so also has the steam-engine been in existence for a length of time, and yet the world seems to have but just awakened to a sense of their value and importance. Steam-vessels and railways have passed their probation; they are now to be considered amongst the established things of the earth. Steam-carriages upon common roads have not attained the summit level; there is a short, and, perhaps, rather steep incline, to be surmounted, but which I have no doubt, will be overcome by patience and perseverance. I am aware, that when railways have been established between the principal towns throughout the country, as they will be, beyond all doubt, they will entirely supersede every attempt to establish common road steam-carriages upon the same line; but it appears to me, that the common road steam-carriage might be introduced as

an efficient and important auxiliary to the railway as branches to the main trunk; take the Eastern Counties' Railway for example; its main trunk running as it does through a rich and fertile country, with many towns to which roads would branch in every direction; might not an efficient and important auxiliary to the the common road steam-carriage be brought to account in this and similar cases, so as to aid its more advanced and fortunate coadjutor,—the railway? Railway companies and proprietors have, in their eagerness to establish their own peculiar mode of transit, strangely overlooked the advantages which might be attained by a mutual co-operation with the common road steam-carriage. There is a species of rivalry existing between them, which, in my opinion, ought not to prevail; neither would it, if the parties interested were to take a reasonable and common-sense view of the subject in all its bearings. My chief object in the present communication, is, however, rather to obtain information than to offer advice. I should feel exceedingly obliged if some of your correspondents would inform me, and the public generally, through the medium of the *Mechanics' Magaziue*, whether anything, and what, is *at present* being done to advance common road steam-carriages, whether Messrs. Gurney, Ogle, Dance, Church, Maceroni, or others, be now engaged in any way upon this subject; and, more particularly, Mr. Walter Hancock, in whom it appears that much confidence is placed. I have taken much interest in the matter from the commencement, and should feel happy to see it brought to a successful termination.

Before I conclude, allow me to offer a suggestion which may be useful both as regards common road steam carriages, and railway locomotives. I would suggest, that at the different stations along the line of railway, some means should be adopted to filter the water that is taken into the tanks, for the purpose of feeding the boiler. There is nothing more essential to the efficient working of a locomotive than a good and clean boiler, and the boiler can only be kept clean by its being fed with pure water. To ensure this very desirable object, filtering beds might be constructed at or near the different stations at a trifling expence, *which would be amply* repaid by the *saving effected upon* the cleaning and repairing of boilers, besides the satisfaction of having them always in an efficient state. With respect to the common road steam carriages, I consider some provision for obtaining pure water, of the very first importance; without some provision of this nature: there tubular and flat chambered boiler must quickly become choked by which they are rendered useless for the time; besides the injury which the iron sustain from the violence of the external heat, whilst deprived of the protection of the water by the coating which is formed upon the internal surface. I could trace nearly one-half of the disasters which have befallen common road steam carriages, to imperfections in the boiler, and not a few of these have had their origin in the impurities taken in with the water. It is to a close attention to little matters like these, that we are to look for the ultimate attainment of this object.

Hoping that this important matter may not be suffered to drop; but that it will be taken up in the spirit which in my opinion it deserves, and with a determination to succeed.

I remain, Sir,

L. M. B.

Birmingham, Nov. 24, 1837.

THE TREFFOS PUMP.

Sir,—I beg to express my grateful acknowledgements to your valuable correspondent, Mr. Richard Evans, for the compliment he has been pleased to pay me in his last communication (page 122,

I have much pleasure in tendering my opinion regarding "the treffos pump" of Mr. Williams, as requested by Mr. Evans; the more epecially, as I can do so in a few words. Mr. Evans having already placed this invention, in all its bearings, in so clear and striking a point of view before your readers, I have little opportunity of doing more than expressing my assent to the correctness of his premises. A 4-inch barrel pump with a treffos, a 2-inch connecter, and a $\frac{3}{4}$-inch feed pipe, would actually cost more money, be more liable to deragement and do less work, than a common 4-inch pump with a regular 2-inch feed pipe; which can be placed "in the most convenient position," quite as easily, as when encumbered with "a treffos."

With ref erence to saving "the powe

by which a long column of water is set in motion a-fresh at each stroke of the pump" this power is furnished by the never-failing and never-tiring pressure of the atmosphere, and is no part of the labour performed by the pumper. Provided the feed pipe is large enough to allow the water to ascend with freedom, the weight equivalent to the altitude of that column is all that has to be sustained by the piston; but, if the feed pipe be so much diminished (either with or without the intervention of "a treffos") as to create a great deal of friction and thereby retard the rising of the water, the piston during some portion of every stroke will be acting against a vacum and will encounter the atmospheric pressure about 15 lbs. per square inch. The supposition that "a treffos" will ensure the certainty of the working barrel being filled with water at every stoke, is a complete fallacy, and the whole contrivance is in direct opposition to the established principles of hydrostatics.

I remain, Sir, &c.

WM. BADDELEY.

London, Nov. 27th, 1837.

WASHING THE PUBLIC BUILDINGS OF LONDON.

Sir,—Much has been said in some of the public journals as to the exertions of the city authorities in the restoration of Temple Bar, previous to the Queen's late visit; so much, indeed, that few would suspect the plain fact to be, that the worshipful corporation have contented themselves with giving the venerable structure an "overall coat" of *yellow whitewash,* after the most approved fashion of the country church-beautifiers of the "Samuel Smear and Daniel Daub" order. The effect certainly is to make it look somewhat cleaner than before, although its aspect is now by no means so venerable as it used to be; its sooty covering, whatever its demerits, gave it an air quite befitting the entrance to such a sea-coal capital as the city of London. Had the aldermen wished to gain a reputation for good taste, they would have been far likelier to attain their object by properly cleaning and restoring the stone-work, and especially the statues—the excellence of some of which might be perceived even through the grime,—*instead of ruthlessly handing over the* whole fabric to the tender mercies of the whitewasher. Now that the Bank directors have demonstrated that it is possible to keep a stone building in clean condition, even in the heart of the city, it will be unpardonable in the proper authorities if a similar system of daily washing (by means of a fire-engine or otherwise) be not generally adopted. St. Paul's cathedral was repaired and cleansed a few years back, but its exterior is now as black and dismal as ever, except on the south side, where the upper part is bleached completely white by exposure to the weather, while the lower part is of the colour of a coal-sack. *Here,* the application of the Bank recipe is most imperatively called for; the principal station of the London Fire-engine Establishment is at no great distance, and a comparatively trifling recompense would probably be sufficient to secure the services of the men in their new character of contributors to the display of the architectural beauties of the metropolis. The Dean and Chapter would surely not object to a moderate outlay for such a purpose; or, if they did, the sum might easily be raised by demanding, say, an additional penny from each vistor to the church. It would undoubtedly be paid far more cheerfully than the "small sum of two-pence, ladies and gentlemen," demanded of every person wishing to enter our great metropolitan cathedral, which said sum is applied to no *visible* use whatever.

The Bank system should also be forthwith adopted at the Royal Exchange, the Mansion House, Guildhall, the East India House, and every other public building within the smoky verge. It would be no small task to wash off from these old-established repositories the coating of soot already accumulated; but, by a timely resort to the prescription, the New Post Office might yet be preserved in its original freshness. In all these cases, the presence of windows will perhaps be stated as an objection; but any inconveniences resulting from this might certainly be obviated by a little care, particularly after the operators had had a little experience. The object is too grand to allow anything but a very considerable impediment to stand in the way of attaining it.

I remain, Sir, &c.

AQUARIUS.

Nov. 21, 1837.

TALEBOIS'S SUSPENSION RAILWAY.

Sir,—I forward you a sketch and description of a suspension railway, which I designed in the year 1833.

Description of Engraving.

A, body of waggon, a half cylinder, resting on the rollers, *c c*, which are placed in the middle distances between B B B, the centres of the wheels of the waggon, which run on the suspension railway *x x x x x x*. The shape of this railway, which must consist of a chain or other flexible material, alters according to the positions of the waggons, the wheels adapting themselves thereto, as represented at A¹, where the middle wheel is at the lowest point; at A² where the same wheel is at the highest, and the outside wheels at the lowest points; and at A³ where all the wheels are at an equal height.

By permitting the load to rest on the rollers, and shaping the carriage as represented, the centre of gravity will be always in, or nearly in, the same level, and be equally supported on *c* and *c*. The centre wheel B, will support half the load, and the end wheels B B, the other half.

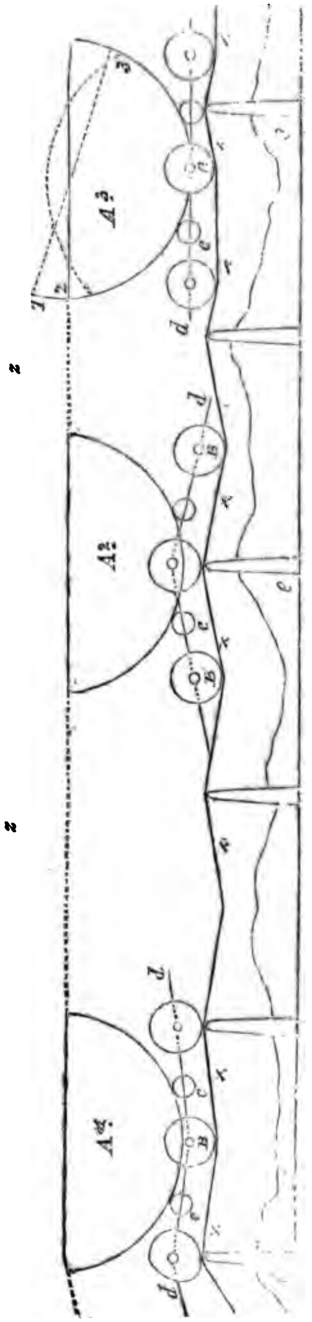
The dotted line *z z*, is the line of direction, and is equal to that of centre of gravity of different loads.

The dotted lines 1 2 B 3 in A³ shows the carriage rolled on *c c*, the same being supposed to be unevenly loaded; the distances of *c c* may be altered so that the weight of the load may be equalised on the wheels B B B; *d d d d* are rods or levers, forming a kind of perch for the carriage, one end of each meets and turns on a pivot at the axes of the centre wheels B; the axes of the end wheels are attached to the other ends of these rods or levers; the rollers *c c* also turn on bearings in these rods; these bearings should be made moveable so as to adjust the carriage according to its load &c.; *e e* are piles or posts driven into the ground to support the railway. From the outline of the land shewn in the sketch it will be seen that cuttings and embankments would be in a great measure unnecessary.

I am, Sir,

Your obedient servant,

E. C. TALEBOIS.



RIDDLE'S SPRING PEN-HOLDERS.

SIR,—The article of writing pens, presents us with some curious combinations of the peculiar properties of elasticity and and flexibility in different degrees; thus, the quill possesses as great degree of flexibility, with only just so much elasticity as is necessary for the perfect action of the pen. In metal pens, on the contrary, a high degree of elasticity is obtained, but unaccompanied by the flexibility so essential to the agreeable performance of the writing instrument.

From the result of some recent experiments, I am induced to believe, that it is impossible to give the genuine properties of flexibility to metallic pens; elasticity to any extent, is easily obtained, but when the elasticity is so great as to give a softness equivalent to the yielding of the quill, the firmness of the latter substance is found to be wanting, and without it a thoroughly good pen can hardly be produced. One of the principal advantages sought for in the employment of steel pens, is durability, and it unfortunately happens, that much of the hardness, and consequently the durability of this metal, has to be sacrificed, in order to obtain a moderate degree of elasticity. Various attempts have been made to remedy these and other difficulties; in some instances by introducing a second elasticity situated in the pen-holder, and so, by employing two elasticities, in some measure to compensate for the unattainable flexibility of the quill.

I believe the first attempt of this kind, was by Dr. Arnott, who patented a pen-holder which slid up within the handle, pressed down by a spiral spring, the action of which could be regulated *ad libitum*, by a nut and screw at the top. Although this holder had some advantages, its motion (being perpendicular on the pen) was evidently in a wrong direction, and it has been almost entirely superseded by some more recent contrivances.

The most successful attempt in this way, is the spring pen-holder invented and patented by Messrs. Monvalle and Co., of Paris, a sketch of which, as improved and manufactured by Mr. Riddle, of Blackfriar's Road, is annexed. This invention *consists of a short silver tube within which is placed a spring carrying the holder for the pen* A, Fig 1.

Fig. 1. Fig. 2. Fig. 3.

This spring yields gently to the pressure exercised in writing, giving a soft and easy motion to the pen, relieving the writers hand from cramp, &c., and preventing scratching of the pen, spurting of the ink. &c. Mr. Riddle has rendered the Parisian spring pen-holder very complete, by the addition of his regulating slide, consisting of a saddle which rides upon the spring, and lengthens or shortens its fulcrum, thereby increasing or diminishing its elasticity at pleasure. This is effected by merely sliding the push B, along the slot towards the pen, or *vice versâ.*

These holders are mounted on handles of ebony, ivory, or tortoise-shell; the latter being a very light and elastic material is the best that can be employed, and is not very expensive.

As it is assential to the utility of the invention to keep the second elasticity (i. e. of the holder) as near the point of the pen as possible, Mr. Riddle has made some short steel pens expressly for these holders.

Fig. 2. shows one variety of these pens; by an ingenious management of the piercing, the greatest quantity of motion is thrown upon the part *a*, at the same time that a considerable length of slit is preserved.

Fig 3. Shews the manner in which Mr. Riddle has carried out the principle of two elasticities, in his improved patent oblique pen. The first yielding (as in the parisian pens) takes place at *a*, while the second, which is equivalent to the spring holder, is obtained by connecting the body of the pen to its stem by means of a spring at *b*. By comparing this, with the original oblique pen, as brought out by Mr. Riddle's late firm (Mordan and Cö.,) and described at page 138 of your 17th volume, the nature of the improvement that has been effected will be obvious.

The peculiar merit of these inventions consits in keeping the two elasticities within a very short distance of each other, as well as enabling the prizers to be placed quite clear of the motive part, while writing.

I remain, Sir,
Yours respectfully,
WM. BADDELEY.

London, Nov. 21st, 1837.

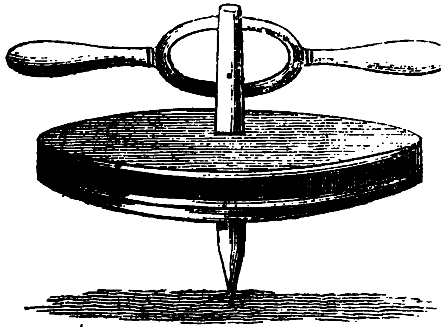
DR. LARDNER ON RAILWAY CONSTANTS—RESISTANCE OF THE ATMOSPHERE—SPINNING TOPS.

Sir,—Being present at the late meeting of the British Association, when the subject of railway constants was brought forward, I was much surprised (with others) to hear Dr. Lardner make so small an allowance for the resistance of the atmosphere to the trains, in calculating velocities; indeed, he scarcely made any allowanee, inasmuch as he considered the resistance so small, even at high velocities, (say forty or fifty miles an hour) as not to be admitted, or taken any account of, in calculating railway constants. This was I may venture to say, immediately dissented from by a great majority of the Section.

Amongst others who tried to convince Dr. Lardner of the fallacy of his reasoning, was Mr. Roberts of Manchester; a very simple illustration of the friction or resistance of air, he gave by relating that he had had a mania for making spinning tops some years ago, and had succeeded in making one spin *forty-two minutes.* A friend requested him to make a top for him, and he took particular pains with it; and to make it look well gave it a coat of lacquer, when he found it would not spin more than seventeen minutes; he removed the lacker, and it spun the usual time. The brassfounder will tell you, that although lacquer preserves the colour of metal, it gives a rough surface to it, and it was this roughness that so much impeded the top as not to allow it to spin half the time it had done previously to its being put on. This roughness too, is so delicate, as not to be detected unless particular attention be directed to it. One would have supposed that this little anecdote would have been convincing to those who heard it, of the vast effect of the air in impeding the motion of moving bodies.

When I got home I set about making a top, the directions for the construction of which I am indebted for to the *Liverpool Mercury*, an extract of which I subjoin with a rough drawing, for the further information of any of your readers who may be disposed to make one, as a philosophical experiment. This top I am enabled to keep in rotation for forty minutes in plenum, and two hours and twenty minutes in an exhausted receiver;

so that the retardation of a moving body, such as this top, is, in air compared to vacuo, one hundred and ten minutes. Again, as Professor Robinson, the Chairman of the Section, stated, from eight to nine seconds is allowed in astronomical clocks, for the friction or resistance of the air upon the pendulum, and hence they should never be lacquered. Indeed, there are not more than two retarding forces to the top, namely, the friction of the atmosphere, and the attraction of gravitation; the latter constituting the friction of the peg it spins upon; and if it were possible to divest perfectly the moving body of these forces, would the top not spin for ever, after the first impetus had been given?



The top as will be seen from this figure, is shaped somewhat like a mill-stone, or a thin Gloucester cheese, rather thicker at the centre than at the sides; the centre part through which the spindle passes, being about an inch in thickness, and about five-eighths of an inch at the edge. It is put in motion like a common humming top, by means of about a yard of cord, passed through the circular hole in the upright spindle; the diameter of which is about four and a-half inches. It is turned out of wood, with a girdle of lead round the edge as represented by the dark shade in the sketch. The lead is inserted into the wood about three-fourth's of an inch; is about four pounds weight, and half an inch thick. The steel pivot or pin, on which the top spins, is about seven-eighths of an inch long, and ought not be brought to too fine a point, as its apt to spin a hole through what you put it in motion upon. The spindle or axle, which is of wood, is about one inch and seven-eighths long, shaped and used exactly like that of a humming top: when the top is about to be put in motion, the cord ought to be wound rather tight round the spindle. One person should hold the two handles firmly, while a second draws out the *cord to its full length. The cord should not be drawn out too rapidly* at first, but *with an accelerating speed.* The plane best to spin it upon, is the enamelled surface of a plate or saucer, as smooth as possible, as motion would be much impeded if the point of the pin should get into any hollow. The plate or saucer must be kept quite steady, which may be done by placing a folded napkin under it; a small portion of fine oil should be rubbed on the surface of the saucer. It is required to be thus minute in the description, and the mode of managing it, as the success of the experiment depends materially upon a careful attention to all these points. The proportion and size above described also appear to succeed better than any other. Tops of this description have engaged the attention, and been made by Messrs. Snow Harris, Troughton, Serson, and other scientific gentlemen, with a view to apply them to artificial horizons, and will be found recorded in the philosophical transactions; and I believe the the Editor of *Liverpool Mercury*, Mr. Egerton Smith, (from whom the most of this description is borrowed,) has one that spins nearly one hour *in plenum*. It would be as well to say, that by a simple contrivance, namely, sticking a knitting needle through a reel of fine cotton, containing 250 yards, and attaching it to the top at full speed, I have been enabled to ascertain to a great nicety the speed of mine that spins 40 minutes; the cotton was run off the reel

in somewhat less than one minute; and from frequent trials, I find it makes no less than 4,500 revolutions in the minute. It will be a calculation for your many mathematical correspondents to say, how many revolutions it will make previous to coming to a state of rest, supposing it spun forty minutes, and made the above number in the first minute; and as the outside edge is four and a-half inches in diameter, how many miles does the edge travel in that time? I am fearful I have been trespassing too much upon your pages,

And remain,

Your very obliged servant,

RICHARD EVANS.

Swansea, 8, Castle-street, Nov. 1, 1837.

MOORING BALLOONS.

Sir,—The thanks of all parties are justly due to Mr. F. Gye, for the great desire he has always manifested for the diffusion of correct information in all that relates to aëronautics; this laudable anxiety, however, has somewhat mislead him, in reference to the matter broached in his communication at page 114 of your last number.

If he will have the kindness again to refer to my letter in your 744th number, he will see that I have neither *misunderstood*, nor misrepresented the nature of his personal communication to me; I merely siated, that "ten years ago" I proposed to obtain a perpendicular descent for the car of a balloon, by taking an elevated point of attachment for the grappling-rope, and mentioned the *hoop* as that point, (Vide Mechanics' Magazine vol 10 page 40). I had imagined the distance between the hoop and the car to be above four feet, but that is not of much consequence. I mentioned Mr. Gye's having informed me that *this precaution* was now always adopted, which is confirmed by Mr. Gye's last letter.

With regard to Mr. Hitchin's plan for attaching the grappling-rope to the *net work* of the balloon, I am quite of opinion with Mr. Gye, that it would, in many situations, prove a highly dangerous experiment.

I remain, Sir,

Yours respectfully,

WM. BADDELEY.

London, Nov. 27, 1837.

MR. UTTING'S ASTRONOMICAL TABLES.

Sir,—I find upon my return from Rob Roy's country, that your astronomical correspondent Mr. Utting, still continues his nibbling, wriggling, and floundering system, for the purpose, I presume, of forcing the readers of the *Mechanics' Magazine* to believe, that his astronomical tables have been computed upon unerring principles, and that he has by some (as yet unexplained) method been able to calculate the tropical periods of all the planets true to the ten thousandth part of a second, &c. With the grand conjunction system, Mr. Utting ought by this time to be well acquainted, as I believe it has occupied a good deal of his attention for at least these nine years past. In No. 280 of the *Mechanics' Magazine*, he made rather an ill-natured attack upon Mr. Squire of Epping, who, it seems, had stated in his Grammar of Astronomy, "that if all the planets were supposed to be in conjunction, they will again be in conjunction at the end of 280,000 years. I do not know the values Mr. Squire gave to the periodic periods of the planets, and therefore, I cannot at present say whether he was right or not: but this I believe, that if Mr. Squire erred, it was not from principles. I have read many of his articles both in the *Mechanics' Magazine*, and *Ladies' Diary*, and I am bound to say, that he is both an able mathematician and astronomer; at least as far as I am qualified to judge. Mr. Utting, however, has discovered (or imagines so at least,) a much shorter period in which all the planets move from one conjunction to another, and this said grand manufactured period of his, also includes a conjuction of all the satellites of Jupiter, Saturn, &c. In imitation of my brother Dominie Samson, I may here exclaim "Prodigious!"

I have in some of my former letters stated, that if Mr. Utting's tropical periods of all the planets are correct, and that if a mean synodic period is obtained from the equation $S = \frac{T T^1}{T \pm T^1}$; whence, T and T^1 are the mean tropical periods of the earth and planets; on that supposition, (that's the rub) I have no hesitation in saying, that he has manufactured the grand period of conjunction G (by the method of continued fractions, I ween,) of all the planets in such a way

that G is an exact multiple (or nearly so), of the expression $\frac{T\,T^1}{T \pm T^1}$. But on the other hand, if $S = \frac{P\,P^1}{P \pm P^1}$; where, P and P^1 are the periodic or siderial periods of the earth and a planet; then, I deny that in any case in the solar system that G (Mr. Utting's G) is a multiple of $\frac{P\,P^1}{P \pm P^1}$. And here, Mr. Editor, I may remark, that the whole matter in dispute about the conjunction of the planets (I have yet said nothing of the conjunction of the satellites of Jupiter, &c., that I may perhaps make the subject of another communication,) lies within the compass of a nutshell. All that Mr. Utting has to do, is to demonstrate that a mean synodic period of a planet is obtained from the formula $\frac{T\,T^1}{T \pm T^1}$. And if he can do so, I shall be the first to congratulate him upon this second wonderful discovery (for an account of his first discovery see No. 650, page 314), and will at once admit, that on this point of astronomy, all the astronomers from the days of Hipparchus, down to the authoress of the mechanism of the Heavens (Mrs. Somerville) have been in error.

Page 37, vol. xxviii, Mr. Utting says, "at page 366, you remark" (aluding to myself), "that according to my principles $S = \frac{T\,T^1}{T - T^1}$; but this you positively deny, notwithstanding my periods are solar or tropical periods, and T and T^1, according to your own showing, are tropical periods also!" The only answer I shall give Mr. Utting on this head is, to request him to examine again my last letter (No. 734), and he will find that the above statement is a complete misapprehension of the facts: or if he is unable to scan an algebrical demonstration (which I suspect is the case, from the very lame solution he gave of the Cambridge Student's Question,) on that account he ought to have submitted my demonstration to some scientific Norfolk Dominie, before he gave currency to his own mistaken notions. Again, Mr. Utting, in continuation, says, "and *farther, you assert that in no case in the solar system is* $\frac{T\,T^1}{T - T^1} = \frac{P\,P^1}{P - P^1}$;" "what a display of intelligence!" "who ever contested such a point," &c. I will here tell Mr. Utting, that he may now pretend to be acquainted with the above-mentioned fact. But sure I am, he knew nothing about it until I gave him the information; his own Astronomical Tables proves this beyond the power of contradiction. And further, Mr. Utting states, "now $\frac{P\,P^1}{P - P^1}$ is equal to the synodic period in respect of the fixed stars; or if I may so express it, the siderial synodic period; and $\frac{T\,T}{T - T^1}$ is the synodic period in reference to the equinox, or the tropical synodic period (!) The latter of which is applicable to my Tables," &c.!

Well, Mr. Editor, if this is not the most profound astronomical nonsense that ever was promulgated, then I must be one of the greatest dunces that ever existed; a tropical synodic period of the planets is certainly something new. Perhaps Mr. Utting will be kind enough to inform the readers of the *Mechanics' Magazine* whether the next conjunction of the Sun and Jupiter is to be considered (counting from the last conjunction,) a siderial synodic period, or a tropical synodic period? I trust Mr. Utting is fully prepared to give a satisfactory answer to this question.

Yours, &c.

A SCOTCH DOMINIE.

Forfarshire, Nov. 16, 1837.

AVERY'S ROTARY STEAM-ENGINE.

We extract the following letters from the *Scotsman* upon the subject of this much-talked-of engine, which is at present taking up a good deal of the attention of Scotch engineers. There is still, however, a lack of *particulars*. Its advocates complain of objections and sneers;—but why not quash them in the most effectual manner, by distinct statements of comparative experiments with a rotary and reciprocating engine? We should be most happy to be convinced of the efficiency of the engine, involving as it does an important step in steam power; and should be the first to acknowledge our conviction, and publish the experiments upon which it is found.

"Sir,—In some of your late papers you gave an account of the rotary steam-engine for which patents for this country have be

obtained by Mr. Alexander Craig of this city, and stated at the same time that I was engaged in bringing it forward. I have completed one of fifteen horse power, and for some time past have had it daily and most successfully employed in my workshop here. As much diversity of opinion exists regarding this engine, and considerable prejudice and ignorance as to its power and principle, supported by erroneous accounts of it, apparently industriously circulated, generally by those who have never seen it in operation, and not having been met by any public counter-statement, it may appear as if these could not be refuted. On that account I consider it proper to give such a description of the engine as may be generally understood.

In this steam-engine, as in all others, the power is generated in the boiler, and the steam conveyed by a pipe to a hollow axle; on this axle two arms are fixed: these are also hollow, with apertures into the axle to allow the steam to pass from the axle into the arms; and at the end of each arm is an aperture through which the steam is discharged at right angles to the arms. The axle is passed through an iron case, in which the arms revolve, and receives the steam on being discharged thereform. At the bottom of the case, the steam discharged from the arms is taken off by a large pipe, and conveyed away. On one end of the axle, after it has passed through the case, is fixed a pulley, and over it and a large drum; a belt passes, and the motion and power are thus acquired and regulated as required. The steam passes directly from the boiler into the hollow axle and arms, and on its escaping from the apertures a revolving motion is produced in a similar manner to a fire-wheel. The simplicity of the arrangements, and the uniformity of the power and motion, is beyond conception; and for every purpose where a perfectly equal motion is desirable, such as spinning, it must be invaluable, and for farming purposes is all that can be desired. Were any additional inducement necessary for the general use of this engine, it may be the price, which, in many cases, will be less than one-half the cost of others of the same power; and as there is no machinery there is no chance of injury to its parts, so that the saving in expense of repairs absolutely necessary in the best constructed piston engine, must in a few years, by that saving alone, make this rotatory engine almost cost nothing.

The economy in fuel will also be found equally important. I may now remark, what I consider as leading to a misconception of the principle of this engine, as I find *it stated in all accounts of it, and generally understood as the source of its power,* and that is termed the *reaction* of the steam (as it passes from the arms) *on the air.* Were this its source of power, I certainly would consider it *a powerless engine;* but it is a very erroneous idea, and calculated to mislead. There is no *reaction,* as thus stated; the arms are impelled by the direct force or power of the steam in the boiler, and have no reaction whatever from the air. Suppose we take a common weighing-beam and scales, with a pound-weight placed in each scale; if we remove one of the weights, the other will drop with the force produced from the pound-weight in it, certainly without any reaction from the air: this is exactly similar to the power of the steam in the hollow arms, on its escape by the aperture at the extremity. To prove to some of my friends that there was no reaction from the discharged steam *striking the air,* I soldered a plate of metal to the end of the arm, at a little distance from the aperture, so as the *steam could strike the plate,* which, in this way, might be supposed would suspend the motion of the arms, or rather, by the force of the steam, to move the arm in the contrary direction; but it carried the plate with it the same as without it. I did this also with what is termed Barker's Mill, and with the same results; thus satisfactorily proving that there is no reaction or resistance, or power obtained from striking the air in either case. But without further argument regarding the true theory of the action of this rotatory engine, the fact of it being *proved to possess the power,* ought to be sufficient to convince or satisfy any unprejudiced mind of its important advantages, and encourage the general use in this country of such an invention.—I am, &c.

"JOHN RUTHVEN.

"Edinburgh, 14th Nov, 1837."

Sir,—At the request of some friends of mine in the United States, I took out patents in this country for a rotatory steam-engine, which had been then recently patented in America. Drawings and specifications were sent me, and assurances of the efficiency of the engine; but on mentioning the matter to scientific persons in this country, they were not only sceptical, but also attempted to turn both the engine and myself into ridicule. Having only slender pretensions to knowledge of engineering, I was induced to visit United States chiefly to examine the rotatory engine with my own eyes, and accordingly I saw the engine in successful operation, not not only in New York, where it was first introduced, but also in Kentucky and other of the Western States; and I was satisfied of the power of the engine, as well as of the accuracy of the original statements of my friends in regard to it, and of its vast utility

to the agricultural, manufacturing, mining, and mechanical interests of this country.

When I was in New York, I met Mr. John Ruthven, engineer, of this city, and, as he appeared to me to be better qualified for superintending the fitting up of the engines in this country than I could be, I introduced him to my friends, and advised them to employ him, which they did; and that a thorough knowledge of the best mode of getting up the engines might be obtained, Mr. Ruthven's son was sent to America, and in the workshop of the inventor and patentee, he obtained every requisite information. He returned some months ago, and since his return, an engine has been fitted up under his inspection; it has been at work in his father's shop for some time past, and realizes in practice all that has been anticipated, and where it may be seen in operation. These rotatory engines are coming into general use all over the United States; and by a letter from Louisville, dated 9th ult., I learn that in the valley of the Mississipi, where "*hydraulic privileges*" are not to be had so readily as in other sections of the Union, they are now common.

Besides the saving in the first cost between this rotatory and a piston engine, (nearly one-half I should suppose,) the saving in superintendence and repairs must be great, because this rotatory engine requires no engineer to look after it; and as there is no intricate machinery to get out of order, repairs are rarely wanted. I saw a rotatory at New York, which had then been two years in constant work, and during that period it had required no repairs, and to appearance seemed as perfect as the day it was put up. The saving of fuel, too, is considerable, and from the kind of boiler used in America, a chimney stalk of eighteen or twenty feet in height, or as high as the ridge of the building, is all that is necessary.

After the steam has performed its duty in impelling this rotatory, it heats the water with which the boiler is charged, and it can afterwards be used in cooking, washing, and other domestic purposes; and as it will steam food for hoises, cattle, &c., on the largest farm establishment, either when the engine is in motion or at rest; it is especially adapted for thrashing mills, where ordinary farm servants are only to be had to attend to a steam-engine, and it will not be injured by standing unemployed for days or weeks together.

I have taken no notice of the objections, or even sneers, which have been publicly thrown out against this rotatory engine, being convinced that it would of itself soon surmount every obstacle.—I am, &c.

ALEXANDER CRAIG.

6, Carlton Street, Edinburgh, 14th Nov. 1837.

HEATING APARTMENTS WITH GAS.

(From the *Paisley Advertiser.*)

We shall first state the simplest way we know of for making the fire available, in the way of rendering few alterations necessary, and of securing an easy return to coal fires, if gas do not please, or of using coal fire and gas fire alternately, accoiding to the seasons, or to other circumstances. We shall suppose, then, that the fire is required in an ordinary Carron grate, in the usual fireplace, and will merely premise, that in this case, the vent requires to be closed up:—

I. *Top Plate.*—Procure a piece of sheet iron of a shape snd size to fit the mouth of the grate. The front of this top plate may be supported on the upper bar of the grate, and the back in various ways familiar to tradesmen. In the centre of this plate cut a circular hole of a size to admit the cylinder that is to be used.

II. *Supply of Gas.*—Lead a gas pipe to the hearth-stone, below the grate; bend its end upwards to pass through between two of the bottom bars; let it project 3 or 3 above the bottom of the grate, and pointing towards the centre of the hole in the top plate. A convenient way of leading gas to the spot wanted, is by a flexible tube. If the end of the tube be properly supported by a candlestick or other bearer, it can either be pointed into the cylinder to produce fire, or set on the mantelpiece to give light. In this way, too, the gas cylinder, instead of being placed in a grate, may be set in an ornamental metal pillar (or by itself without one), and placed occasionally in any part of the room to which the flexible tube will extend.

III. *Gas Cylinder.*—Procure a piece of sheet-iron stove-pipe, or cylinder, of a diameter from three to eight inches (four or five will probably be found a good size for a room 15 feet square), and of a length about half an inch more than the distance from the top-plate to the bottom of the grate, which in most cases will be from 8 to 10 inches. Cover one end of the cylinder with a piece of fine iron wire gaze, such as is usd for Davy's patent safety lamp. This wire gauze is secured in its place by a small iron ring or hoop, tightly circumscribing the cylinder; put this cylinder down through the hole in the top-plate, and it will rest on the bottom of the grate, whilst the gas-pipe will project into it ready to discharge gas. Open the stop-cock, apply a light to the gas—not where it issues from the socket or burner, but on the top of the wire-gauze, and the fire is obtained. If too little gas go into the cyliuder, it will not kindle; if too much, the flame will burn white instead

of blue, and not give heat in proportion to the extra consumpt of gas.

IV. *Use of Lime.*—When lime shell is slaked, or reduced to powder by the application of water, and passed through a sieve, a number of little balls, of the size of small marbles, will be found around the heap. Ten or a dozen of these pieces laid on the wire gauze, soon assume a bright red colour, and give a more cheerful appearance than the fire would otherwise have. These pieces last many days, getting a little smaller daily, and can be renewed at pleasure.

V. *Easy return to Coal Fires.*—Should the gas fire not produce sufficient heat for very cold weather, or should it on trial not please, the vent may be unstopped, the top plate and gas cylinder removed and set aside in one minute, and the grate is ready for a coal fire as before.

VI. *Gas consumed and Effects produced.*—With a cylinder of 3½ inches diameter, the gas consumed hourly will be 6 or 7 cubic feet—equal to six or seven single jet burners burning 4 inches high. This, at the price of gas here at present (8*s*. 6*d*. per 1,000 feet), will be between a halfpenny and three farthings an hour. A cubic foot of gas with a cylinder of the size above mentioned, will, in a tin vessel 5 inches in diameter, and 3 inches deep, boil a quart of water in ten minutes. Whether that quantity of gas would produce the same effect, if burned in half or quarter of the above time, we have no means of ascertaining.

VII. *Increase of Heat.*—If an iron cylinder 8 or 10 inches long, or more, of a diameter sufficient to circumscribe the iron ring that keeps the wire gauze in its place, be put on the top of the fire, it causes it to burn more vividly, on the same principle, no doubt, as steam-boat funnels or stalk-vents create a draught. More gas, we presume, is thereby consumed, but we cannot say how much.

VIII. *Disadvantages of Gas Fire.*—1. From paragraph VI. it may be inferred, that fire from gas is dearer than from coal, and this will be deemed a fundamental objection. 2. The quantity above mentioned does not produce so great a heat as a moderate coal fire. 3. It has not so cheerful an appearance, the bright bars and "bleezing ingle" being a-wanting. 4. It gives out a slight sulphery smell, similar to what is felt when a shovel full of hot cinders are left for a little while in the centre of a room, and thereby requires the upper half of a window or two to be left a little way down. 5. It may not be deemed advisable to trust the warming of the house or the cooking of the victual to a fire over which others have so *much controul.* A lightening of the pressure at the gas works might leave the dinners of hundreds only half cooked at the hour when they should be eaten.

IX. *Advantages of Gas Fire.*—1. All the trouble attendant on the kindling of a coal fire, on the supplying it with coals, and the removal of ashes, is avoided. 2. The annoyance of having carpets, furniture, pictures, books, &c, covered with dust every time a poker is applied to a coal fire, is avoided. 3. In cases where chimneys cannot be made to draw or vent well, this affords a decided remedy. 4. In rooms where there are no fire places it must be found exceedingly useful. 5. In cases where fire is speedily wanted this has the superiority, inasmuch as it can be obtained at its full strength instantaneously, and a kettle may be boiled, or a breakfast cooked by it, before before a coal fire could be got properly kindled. 6. In summer, when victuals must be cooked, when fire heat is oppressive, this will prove advantageous, because it need not be lighted till the moment it is wanted, and extinguished when the required purposes are served. Admitting of being thus carefully husbanded the disadvantages of its high price will in some measure be diminished.

X. *Conclusion.*—We have thus stated how the gas fire is to be most easily made available in a way that subjects the experimenter to little expence of fitting up, and admits of an easy return to coal fires. We have stated its cost as nearly as we can, and have summed up its most prominent advantages and disadvantages, so far as these have yet appeared, and we now leave the subject in the hands of the public to adopt or reject this new species of fire as they shall see cause.

LIST OF ENGLISH PATENTS GRANTED BETWEEN THE 26TH OCTOBER AND THE 28TH NOVEMBER, 1837.

Joseph Whitworth, of Manchester, engineer, for certain improvements in locomotive and other steam engines. Nov. 2; six months.

Richard Burch, of Heywood, engineer, for certain improvements in manufacturing gas from coal. Nov. 2; six months.

Joseph Lockett, of Manchester, engineer, for certain improvements in the art of printing callicoes and other fabrics of cotton, silk, wool, paper, or linen, separately or intermixed; being a communication from a foreigner residing abroad. Nov. 2; six months.

James Gowland, of Leathersellers Buildings, London, watch and chronometer maker, for a certain improvement or improvements in the mechanism of time keepers. Nov. 2; six months.

Richard Joshua Iremonger, of Wherwell, Hampshire, Esq., for an improved spring or arrangement of springs for wheel carriages. Nov. 4; six months.

John Upton, of New-street, Southwark Bridge, Surrey, engineer, for an improved method or methods of generating steam power, and applying the same to ploughing, harrowing, and other agricul-

ses; which method or methods is, or are able to other purposes to which the sam is, or may be applied. Nov. 4; six

Arthur, of Glasgow, machine maker, ements in spinning hemp, flax, and us substances. Nov. 4; six months.

ıdolph Ortman, of Stockholm, Sweden, enezer-place, Limehouse, Middlesex, for or methods of freeing, wholly, or paren, or or other porous vessels from cer- ı matters or substances which they are sorb, and of turning to a useful account matter or substances so liberated or ex- Nov. 4; six months.

leakin Midgley, of the Strand, Middlesex, nd John Howard Kyan, of Cheltenham, , Esq., for an improved mode of extract- ining ammoniacal salts from liquor pro- ıe manufacture of coal gas. Nov. 4; six

François Edward Aulas, of No. 38, Grande , Paris, gent., now of Cockspur-street, for an improvement or improvements ıg writing-paper, so as to prevent the ıf the ink therefrom without detection, ent the falsification of writing thereon; ly a communication from a foreigner re- ov. 7; six months.

Michell, of Kingsland Green, Middlesex, ements in washing, or purifying smoke s evolved from furnaces of various de- Nov. 7; six months.

Hughes, of High Holborn, Middlesex, r, for an improvement in stocks, cravats, . Nov. 7; six months.

François Edward Aulas, of 38, Grande , Paris, but now of Cockspur-street, Mid- ıt., for a new and improved method of d working wood by machinery; being a ation from a foreigner residing abroad. x months,

tter, of Ancoats, of Manchester, cotton r an improvement, or improvements in s of preparing certain descriptions of the loom. Nov. 9; four months

llater, of Salford, gent., for certain im- s in steam engines, and also in boilers rnaces used for the generation of steam, seful purposes. Nov. 9; six months.

Wye Williams, of Liverpool, gent., for provements in the means of preparing the naterial peat moss or bog, so as to render ıle to several useful purposes, and par- r fuel. Nov. 11; six months.

Crosley, of Hooper Square, Middlesex, eer, for improved means to be employed cturing beet-root, and other vegetable ı, for the purpose of obtaining sacharine erefrom; being a communication from a esiding abroad. Nov. 11; six months.

haw and Benjamin Ledger Shaw, of Hud- nd Holney, York, manufacturers, for im- s in preparing woollen and other warps. six months.

White, of Nottingham, lace maker, for ents in the manufacture of ornamental . 14; six months.

Stansfeld, of Leeds, merchant, for cer- inery of a tappet and lever action, to pro- rtical or horizontal movement, through m of ropes or bands working over, under, pullies; being a communication from a esiding abroad. Nov. 14; six months.

Coles, of Charing Cross, Middlesex, Esq., ements in gunnery, and in gun and other carriages, and in the means of connecting the same. Nov. 14; four months.

Robert Whitfield, of Hercules Buildings, Westminster Road, Surrey, gent., for a composition which he denominates, "an indelible safety and durable black fluid writing ink." Nov. 14; six months.

John Jeremiah Rubery, of Birmingham, Warwick, umbrella furniture manufacturer, for certain improvements in the manufacture of part of the furniture of an umbrella; being a communication from a foreigner residing abroad. Nov. 14; six months.

Joseph Birch Mather, of Nottingham, mechanic, for certain improvements in machinery employed in manufacturing hosiery goods, or what is commonly called frame work knitting. Nov. 14; six months.

William Neal Clay, of West Bromwich, Stafford, chemist, and Joseph Denham Smith, of St. Thomas's Hospital, Southwark, student in chemistry, for certain improvements in the manufacture of Glass. Nov. 16; six months.

William Herapath, of Bristol, Somerset, philosophical chemist, and James Fitchew Cox, of the same place, tanner, for a certain improvement or improvements in the process of tanning. Nov. 16; six months.

William Fourness of Leeds, painter, for a certain improvement or improvements in ventilating pits, shafts, mines, wells, ships' holds, or other confined places. Nov. 16; six months.

James Buckingham, of Miners Hall, Strand, for certain improvements in the means of ventilating mines, ships, and other places, and in apparatus for effecting the same. Nov. 16; six months.

Thomas Birch, of Manchester, machine maker, for certain improvements in carding engines, to be used in carding cotton and other fibrous substances. Nov. 18: six months.

Elisha Haydon Collier, of Globe Dock Factory, Rotherhithe, formerly of Boston, North America, for certain improvements in machinery, applicable to the raising fluids and other bodies. Nov. 21; six months.

Christopher Nickels, of Guildford-street, Lambeth, gent., for improvements in embossing or impressing the surfaces of leather and other substances applicable to various purposes. Nov. 20; six months.

Elisha Wylde, of Birmingham, engineer, for certain improvements in locomotive, and other engines. Nov. 21; six months.

James Matley, of Paris, and of Manchester, Lancaster, gent., for certain improvements in machinery for the operation of tiering, used in printing cotton, linen, and wollen cloths, silks, papers, and other articles and substances, to which block printing is, or can be applied. Nov. 23; six months.

James Jamieson Cordes, of Totol Lane, London, merchant, for an improved mortar for dressing rough rice, or paddy, or re-dressing rice. Nov. 25; six months.

Henry Purser Vaile, of Oxford-street, for improvements in rails for railroads. Nov. 25; six months.

Richard Tappin Claridge, of Salisbury-street, Strand, gent., for a mastic cement, or composition, applicable to paving, and road making, covering buildings, and the various purposes to which cement, mastic, lead, zinc, or composition are employed; being a communication from a foreigner residing abroad. Nov. 25; six months.

Samuel Cocker, of Porter Works, Sheffield, manufacturer, for improvements in making needles. Nov. 25; six months.

Thomas Moore, of Ison Green, Nottingham, lace manufacturer, for improvements in machinery for frame work knitting. Nov. 27; six months.

Samuel Draper, of Basford, Nottingham, lace maker, for certain improvements for producing ornamental lace or weavings. Nov. 27; six months.

John Dover, of Thames-street, merchant, and William Jones, of Bartholemew Close, chemist, for improvements in filtering fluids. Nov. 28; six months.

LIST OF SCOTCH PATENTS GRANTED BETWEEN THE 22D OCTOBER AND THE 22D NOVEMBER, 1837.

Henri Quentin Tenneson, late of Paris, but now residing in Leicester Square, Middlesex, gent., in consequence of a communication from a foreigner residing abroad, an improved construction of the portable vessels used for containing portable gas, and of the apparatus or machinery used for compressing such gas therein, and an apparatus or mechanism for regulating the issue or supply of gas, either from a portable vessel, or from a fixed pipe communicating with an ordinary gasometer. Sealed 28th October, 1837.

James Matley, of Paris, and Manchester, gent., for a machine, called a tiering machine, upon a new principle for supplying colours to, and to be used by block printers in the printing of cotton, linen, and woollen cloths, silks, paper and other substances and articles to which block printing is, or may be applied without the aid or assistance of a person to tier upon. November 4.

Thomas Bell, of South Shields, Durham, manufacturing chemist, for improvements in the manufacture of sulphate of soda, which improvements, or parts thereof, are applicable to other purposes. November 4.

John Joseph Charles Sheridan, of Ironmonger-lane, London, Chemist, for certain improvements in the several processes of saccharine, vinous, and acetous fermentation. November 9.

William Arthur, of Glasgow, machine maker, for improvements in spinning hemp, flax, and other fibrous substances. November 9.

Baron Henry de Bode, Major General in the Russian service, of Berner-street, Middlesex, for improvements in apparatus for retarding and stopping chain or other cables, or ropes, on board ships or vessels. November 20.

Hamer Stansfield, of Leeds, York, merchant, for having imported an invention for the application to certain machinery of a tappet and lever action, to produce a vertical or horizontal movement, through the medium of ropes, or bands, working over, under, or round pullies, as also of a new arrangement of mechanism for throwing certain wheels in and out of gear; communicated to him by Christian William Schonherr, of Schneeberg, Saxony. Nov. 20.

Frederick Burt Zincke, the younger, of Crauford-street Marylebone, Esq., for the preparing, or manufacturing of the leaf of a certain plant, so as to produce a fibrous substance, not hitherto used in manufactures, and its and its application to various useful purposes. Nov. 21.

John Hansom, of Huddersfield, York, leaden pipe manufacturer, and Charles Hansom, of the same place, watch maker, for certain improvements in machinery, or apparatus for making or manufacturing pipes, tubes, and various other articles from metallic and various other substances. Nov. 22.

William Gilman, of Bethnal Green, Middlesex, engineer, for an improvement or improvements in steam boilers, and in engines to be actuated by steam or other Power. Nov. 22.

NOTES AND NOTICES.

City Victoria Medal.—It will be recollected that the commemoration of events of national interest by appropriate medals, or coins, was a point much dwelt upon by various witnesses examined by the House of Commons' Committee on Arts and Manufactures, as a means likely to improve the taste of the people in the fine arts. The popularity which has attended the publication of the beautiful medal engravings, by the machinery both of Bate and Collas, proves that the tone of the public mind is favourable to such works. In accordance with this publicly evinced feeling, Messrs. Griffin and Hyam have issued a medal commemorative of her Majesty's visit to the City. The likeness of the Queen is good; it has that juvinality of expression which is wanting in all the other portraits that we have seen. We cannot bestow the same praise on the allegorical design which (fortunately) forms the reverse of the medal.

Adelaide Gallery of Practical Science.—On Monday last this exhibition was opened, after having been closed for a short time for the purpose of re-arranging the models, apparatus, &c. exhibited. On the Saturday previous we attended what was called a *private* view—so private, that the crowd prevented us from taking particular note of any of the many subjects of interest shewn. We could not help being struck, however, with the beauty of some embellished slate furniture, made by Mr. Sterling, in the manner we noticed some time since. It is necessary that these productions should be seen, to be convinced that so apparently rough an article as slate, can be worked up to such a pitch of beauty. We shall take an early opportunity of noticing a few of the most prominent subjects of exhibition at the Gallery.

Ford's Fire Escape—The Hon. Commissioners of her Majesty's Woods and Forests have handed a certificate, of which the following is a copy, to Mr. Ford, expressive of their opinion relative to his simple and ingenious machine.

"This is to certify that we have examined the Fire Escape invented by Mr. Ford, of the London Road, Southwark, that it has been applied in this department, not only for the purpose for which it was originally invented, but for the painting, repair, &c. of the exterior of buildings, and that it is, with our sanction, now deposited in several of the palaces and public buildings under the supervision of this Board.

"Duncannon.
(Signed) "B. C. Stephenson.
"A. Milne."

Supplement to Vol. xxvii, containing title, index, contents, lists of patents, and portrait of Dr. Ure, M.D., F.R.S., &c., is published, price 6d. Also the volume in cloth, price 8s.

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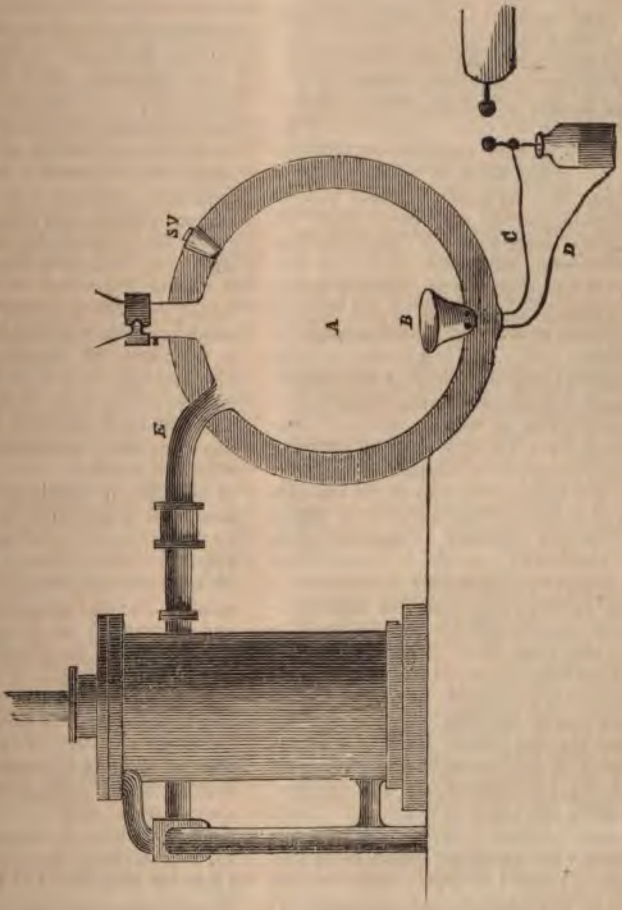
Mechanics' Magazine,

MUSEUM, REGISTER, JOURNAL, AND GAZETTE.

No. 748.] SATURDAY, DECEMBER 9, 1837. [Price 3*d*.

POTTER'S GUNPOWDER ENGINE.



POTTER'S GUNPOWDER ENGINE.

Sir,—It has frequently struck me that the explosive force of gunpowder might be employed as a first mover with great advantage, both on the score of economy, and the diminished space that would be required for the engine. I saw lately in one of the public prints, that a Mr. Smith, of Dysart, had perfected an engine on this principle, but no particulars of arrangement are given, although the startling fact of the immense pressure of twenty-six hundred weight on the square inch was asserted, and that consistent with perfect safety.

The engine was likewise stated to occupy twenty times less space than a steam engine of equal power; and a saving of 80 per cent. in regard to fuel, effected. I am no engineer myself, and if a few crude ideas as to the mode of applying this formidable power will be acceptable, you are welcome to them. A moment's inspection of the drawing, which accompanies, will give the outline, which some mechanical and scientific genius will perhaps so fill up and amplify, so as to apply it to some purposes of general utility. A is a strong metallic globular vessel, into which is introduced, at regular intervals, by the rotation of a stopper, or plug, with a cavity of convenient form in it, a certain quantity of gunpowder, to be supplied constantly. This will fall into the cup B, at the bottom of which are two small brass knobs at a proper distance, communicating with the wires C, D, which proceed from the positive and negative surfaces of a small Leyden vial, which is kept constantly charged by the revolution of a small electrical plate. Now it is easy to see how both plate and stopper, or plug may be made regularly to revolve by the engine itself, and that with the expense of scarcely any power. S V, is a safety-valve. E is the pipe to convey the power from the generator A, to the cylinder, which is the same as that used in high pressure engines. In the drawing the generator is much too small compared to the cylinder; but the proper size can only be determined by experiment. It is to be set in motion, by first of all putting on the safety-valve the proper weight, then throwing in by the plug a sufficient number of supplies of powder, (which are *each to be* separately detonated by the electricity) until the valve is rai blows; then the connection being between the piston and generato the plug and electrical plate throw gear, the movement will be con by the engine itself.

Excuse my troubling you wi trifle, which, perhaps, if brought the public by you, may, by the ge some of your readers be made av for the benefit of the community.

Your obedient servant.

W. H. Pot

24, Garlick Hill.

COATHUPE'S PATENT IMPROVE CESS OF MANUFACTURING G

Mr. Coathupe, the eminent gla nufacturer of Wraxall, near I lately obtained a patent for a ve portant improvement in the pro manufacturing glass. According ordinary methods of manufac crown, window, and other sorts o except bottle glass, the silicious, al and other constituent materials in a state of dryness, or nearly so mixed together previous to fusion. alkaline portions of these materials in such state of dryness, or appr tion thereto, are the products of tedious and operose processes of ration and calcination. Mr. Coat improvement, consists in addi alkali, or alkaline salt or salts in of solution, or partly in a state ness, and partly in a state of so by which means, and according extent in which alkali, or alkali or salts are employed, in such s solution, the said processes of evap and calcination are dispensed wit a much better result obtained at less expense.

The following is the manner in this improvement is effected:—Fi throwing the various constituent rials of the sort of glass intende manufactured (excepting the a only) into a reverberatory furnac state of dryness, or approximation to, as heretofore. Secondly, in add alkali, or alkaline salt or salts, in of solution, of such strength as is by the usual tests, or judged from i tion to be sufficient for the purpos troducing the same through an a in some convenient part of the s verberatory furnace. And, thir

ards continually stirring the whole said materials till the mixture has rated to dryness, or nearly so. It imes happens that the alkaline so-, when about to be introduced, is to be of insufficient strength or not ficient quantity. In such cases it venient to make up for the de-y, in strength or quantity by add-much dry alkali, or alkaline salts y be proportionate to such de-y, to the other materials, thrown first instance into the reverbe-furnace. Where circumstances ot conveniently allow of a solution alkaline materials being previously ed (which is the mode found in e to be best), the course to be ed in such cases, and which Mr. upe has found by experiments e a great advantage over the or-process, is to throw the whole of terials, alkaline as well as silicious, e reverberatory furnace in a state ness, or approximation thereto, and o pour upon them as much water y suffice for the solution of the e salt or salts, after which the e is evaporated to dryness, or so, as before directed.

Coathupe claims in his patent, employment of the alkali or alka-lts, necessary to the production of , window and other sorts of glass glass excepted), in a state of solu-r partly in a state of dryness, and in a state of solution; and whe-so they are reduced to such state ution before or after their intro-n into the reverberatory furnace."

VEMENT IN PADDLE-WHEELS.

—You paid me the compliment of ng in your useful Magazine of t 5, a new plan for a paddle-wheel; I consider may be found most ageous for, and add safety to, river tion, applied to a double boat pro-constructed.

enture now to suggest another which, for smoothness of work-d efficacy, as also for its simpli-pears to me, as to general appli-, of great service. The prin-are so plain, that I think most s will comprehend it, and see the ages. The usual float of pad-eels are broad surfaces, set at cer-tain distances to strike the water, as it is supposed, with more force or efficacy on such resisting medium, which, striking effects the progression, paddle-wheels being entirely open in the interstices between the floats.

The source of propulsion by the resisting medium of the water, is in the weight of the resistance of that body, acted on by the stroke of the float; if therefore we can give a mode of construction that will take advantage of the same weight, by the stroke of a float of less breadth, and with less abrupt action in striking the water in consequence of such less breadth; and also by the water being admitted on its surface more gradually, by the greater number of floats, instead of the direct concussion of the larger body of water; I apprehend the object will be effected, of the greatest force with the smoothest working.

I will endeavour to demonstrate the problem thus:—If a float is three feet broad, and one foot deep, the efficacy of its stroke on water is equal to the weight of resistance of that body of water, effected by that surface of the float passing through it; but the wheel being entirely open in the interstices between the floats, there is a great loss of the resistance of the weight of the water, as it more readily escapes through such entire open space between each float. The contrary, if the water is confined between each float, by enclosing the sides; then so much resistance of weight is added, as the body of water gives which is prevented escaping at the sides. Nevertheless, some opening is required, both to let the water flow into the space before the float, as well as to let it escape; that it may have a continued action of resistance in the water flowing in as the rims descend, as well as relief of the body and weight of water by its escaping, as it rises.

This object it appears to me is to be effected by the simple plan of having paddle-wheels double rimmed as deep as the floats, and as broad; the floats set at moderate distances between them; and I recommend the openings at the periphery of the wheel to form squares. By this means there will be a continued action on the body of water included within the rims and floats, the weight of resistance of which will be equal to broad floats of the spaces so confined, and yet working on the surface of a narrower, but almost

continued, column of water confined by the rims; and the concussion graduated by the diminished spaces between the floats; while the water is admitted at the opening between the floats at the entrance of the periphery of the wheel as it is immerged, and passing out at either opening of the inward or outward edges of the rims, as they rise. A wheel with floats of 3 feet breadth, may thus be reduced to one foot, or little more; and as less power is lost in its working, the depth in the water may be proportionally decreased, and consequently, its diameter diminished, and less power will be required to work the smaller wheel; which will likewise offer less surface exposed to the weather, both of wind and water.

The experiment may be very easily tried, and at little expense, by any manufacturing engineer, on a pair of old wheels.

Yours, &c.

AN OLD CORRESPONDENT.

October 14, 1837.

P. S. Having well considered the proposed plan, I think the improvement may yet be extended most considerably by deepening the proposed rims, but not actually to close up the upper part, or that portion nearest to the axle; and I think that the smoothness of working, and power, will probably exceed all expectation that I may have formed of them.

October 30, 1837.

FIRE-PROOF METALLIC CEILINGS.

Sir,—I beg to forward for insertion in your valuable Magazine, a few hints upon the construction of ceilings in dwelling-houses.

The usual mode of forming a ceiling, is by nailing fir laths to the under side of the flooring joists, and rendering upon these a coat of lime and hair, which when set is followed up by one or two more coats of finer mortar according to the quality of the work. As the whole of this weight of material, is suspended from the joints by a few small cast-iron nails, it is rather a matter of surprise, that ceilings do not crack, and go out of repair sooner than they do, especially as the workman cannot see whether the *first coat is well keyed,* (or run over upon the top of the laths) upon which depends all the strength of the ceiling thus constructed.

The first parts of a dwelling which require permanent repair, are the broken ceilings, and if the house be inhabited, a dirty and annoying repair it is to the inmates.

Having reviewed the defective formation of ceilings of the ordinary construction, let us see whether thin iron zinc or other metal might not be advantageously substituted.

I have been at some trouble to satisfy myself upon the strength of metal I should recommend, and the results I now give. Sheet iron with nails or screws, one pound one ounce per foot superficial. Malleable zinc, with nails or screws, one pound one-half ounce.

It would be a matter of consequence to have the metal strong enough not to bulge between the joists, and yet not unnecessarily heavy, to add to the expence, and to also distress the nails or screws, by which it would be fastened up.

I have had an opportunity of ascertaining at some houses lately pulled down, the average weight of lath and plaster, which I found to be four pound six ounces per foot super.; therefore, in point of weight, suspended to the joists, metal has a considerable advantage, being only one-fourth.

The cost of a sheet-iron ceiling would be about 10 per cent., and zinc about 15 per cent., more than a lath and plaster ceiling.

No comparison of durability after what has been remarked of lath and plaster, can be requisite. The spread of accidental fire from room to room would be in a great measure retarded by metallic ceilings. In very hot weather or after sickness, a small plate in each ceiling up to the roof, might be unscrewed, and a thorough ventilation obtained.

One of the greatest delays in completing a building is in the ceilings; of course no work can be allowed in it, till the first coat is well set to the laths, but in forming a metal ceiling, the operation would be performed in a tenth part of the time required to lath and lay a ceiling, and the workman could be fixing it whilst the carpenters and others, were working about him, nor would frost be any hindrance.

ould prefer zinc as it would not om any damp occasionally pene- ; from the joists of the floor above, ım aware of its melting point being too low to be a safeguard against

ets of either metal can be rolled to ngth that would be required, so ıere would be no occasion for cross and they would be wide enough :e a-cross two joists, the sheets ıg half-way along the joist on a joint would be required. Either ı or nails might be used from two r inches apart, according to the ess of the metal.

holes should be punched larger he stalk of the nail or screw, or vould be better, along and under oint thin stripe of metal might be d up, leaving the sheets free in xpansion and contraction.

ı whole would be finished with nd whiting as usual, or with oil , or covered with paper of any light n and colour. Many other advan- would result in the use of metal gs.

I am, Sir,
Your very obedient servant,
WM. VERE.

BRIGHTON GAS WORKS.

—R. Y. in his letter dated the 21st complains that I have made sweep- nimadversions upon the manage- (*i. e.* mismanagemen) of gas works, ıt assigning data in support of my rations.

Brighton seems to be more an ob- f interest to R. Y., than Bristol, hester, or Birmingham, I should hought that the data furnished by tter, in reference to this particular was even more than sufficient to s the proprietors there, to adopt ıres for the remodelling of their fect works.

his gentleman will read my com- ation attentively, he will find it ied in plain terms, that the heavy l loss incurred by this establish- is chiefly to be attributed to an ountable fancy for clay retorts; gh the innumerable fractures of ıich a considerable quantity of gas necessarily escape.

ave no *wish at present to* enter into a lengthened exposition of the blunders committed in the construction of the Brighton Gas Works. But in the mean time, it may be of advantage to those concerned, to be acquainted with the fact, that there is not in all England a single gas factory constructed upon more defective principles. I may mention, amongst others, one unsightly blunder, that of erecting the hydraulic main on the roof, in the very gutter of the retort house!

This position is the farthest in the world from being judicious, economical, or in any way whatever advantageous. On the contrary, the safety of the works is endangered by this novel elevation of the hydraulic main.

I have not lately tested the gas manufactured at Brighton; but if the same system that was followed some time ago be persisted in, of charging their tanks with tar and ammonia, instead of pure water, the sooner it is amended the better. No man who is acquinted with the chemical properties of carburetted hydrogen, procured from the decomposition of coal (for illumination,) would expose a volume of this air to the impure exhalations which proceed from several thousand cubic feet of tar and ammonia, confined in the tank, immediately over which this body of gas is suspended.

What is the use of purifying the gas with lime, if after so doing, the purified gas is afterwards immediately exposed to the action of the azotic or nitrogen and sulphurous effluvia which is continually evolved from the contents of the gasometer tanks? This effluvia in combination with carburetted hydrogen retards and in other respects injures the regular combustion of the gas. At a low or cold temperature the deteriorating effects of the tar and ammonia are diminished, but in the summer and autumnal months, when the metal of the gasometer becomes heated by the sun, the vaporization of the incombustable gases I have alluded to, must affect the quality of the carburetted hydrogen to a serious extent.

I would ask whether any statement could demonstrate more clearly the imperfect knowledge of the Brighton Company than the notorious fact, that the mains, syphons, and valves, also the services and tubing were in such a state of inefficiency from the accumulation of solid deposits, as to cut off in a great measure

the supply of gas from their disappointed consumers?

R. Y., is now probably supplied with more data in support of my animadversions than either he, or the Brighton gas makers require.

A more attentive perusal of my letter than R. Y. seems to have indulged in, will convince him, that it is the proprietors of gas works and consumers I am desirous of serving; not as he is pleased to intimate a disposition on my part to render Mr. Hutchison's well known abilities more conspicuous. I however, heartily concur in the opinion, that Mr. H.'s talents require no emblazonment from my humble pen.

PETER PINDAR.

P. S.—In number 671 of the *Mechanics' Magazine*, an answer will be found to that part of R. Y.'s letter, which refers to the comparative size of furnaces, he will there find that *one* furnace of *small dimension* is capable of heating eleven retorts, by adhering to the principle set down in Hutchison's patent.

P. P.

November 22, 1837.

COLONEL MACERONI'S CORRESPONDENCE—OYSTER-SHELL AND LIME MANURE, ETC.

"*Risu inepto res ineptior nulla est.*"

Sir,—How crafty is that corresponding "H.," of yours! Nothing escapes him! If a mare's nest were at the bottom of a draw well at the antipodes, he'd have it up! See what a fine one full of eggs he's got, and how gracefully he exhibits it to the readers of your 746th number! "*Suaviter in modo, fortiter in re*" ought to be engraved on every button of his coat! But to the mare's eggs! This first smallish one, contains the discovery of Colonel Maceroni's having claimed the invention of oyster-shell manure in number 743. Now, to any common reader, what the Colonel says, cannot convey any such assumption. Far from calling himself the "inventor" of the oyster-shell manure, or thinking anything about invention, he gives credit to the writer "Calx," for "giving us a very useful suggestion" and merely says, that he has tried the oyster-shells himself!

But here, gentlemen, is a much finer *egg in "H.'s nest.* Hard lime-stone or Parian marble, otherwise called carbonate of lime, otherwise carbonated hydrate, or hydrate carbonate, which I observe the writer quoted by the *True Sun*, tells us, should be reduced to powder and strewed upon the land instead of lime as I have stated;—this hard carbonate of lime or limestone is, says "H.," quite easy to reduce to impalpable powder, and he is astonished that even I should be ignorant of his method! You "have only to throw water over the hard limestone," (I spoke of in my remarks), and says "H."—heigh presto!—"the hard limestone gives no further trouble, but forthwith reduces itself to powder"! Alas! for the carbonate of lime Alps, and Appinines! Make haste good "H.," hie thee to the Ordnance office and tell them how you can form a breach in fortresses and bastions of marble, only with an hot-house squirt! Caution them also to keep the rain from Plymouth bulwarks, all which are built of this "hard limestone which gives no further trouble;" —then tell the paviours to preserve the flags of London footpaths against slacking by the rain!

Another of this "H.'s" mares' or asses' eggs, contains a tiny humming bird, fast asleep, or hybernating, as every child in some parts of South America knows they do, in holes and hollow trees during the long rainy season.

"H." witty punning allusion to the swallow, and my provision for the swallows of your readers, are too contemptible for the notice of,

Sir,

Your obedient humble servant,

F. MACERONI.

LIME AND OYSTER-SHELL MANURE—

Sir,—Your correspondent "H." attempts to be witty and caustic in his remarks upon the suggestion offered by your humble servant "Calx," with respect to the collecting of the London oyster-shells for purposes of manure. H. appears to know "all about the matter;" one would almost be induced to think that he had been brought up in "the oyster line" from his earliest infancy, and had bruising and pounding of their shells quite at "his finger's ends." He informs us, that "neither Calx nor Colonel Maceroni can lay any valid claim to the discovery." What discovery does he allude to? Calx

s, that the great quantity of shells scattered about the metro- a nuisance, and suggests merely y should be collected and turned unt by a company as manure. t would appear that the object of ack is not Calx, but the unfor- Colonel Maceroni. I am wholly s to conceive by what concatena- circumstances the "random re- ons" of the intelligent Colonel ouse the wrath of the redoubtable whatever position the claims of nel to the "discovery" may stand, owledge of the subject is some- iperior to that of the critical H. often admired the acumen of this ian when dealing with statements ts, and I would recommend him ine his correspondence to this of criticism, leaving chemistry chanics to others. In H.'s words ' it (the lime stone) has been y burnt," lies the objection—that xpence. Colonel Maceroni placed rge under the wrong head, that nding the hard limestone" instead of burning the limestone in After the burning, it may be easily l to a powder as H. states.

ist be allowed that Colonel Mace- s on many occasions manifested lue eagerness to claim whatever ppen to be suggested by others, thing in my opinion can justify eral attack of H.

Yours, &c. CALX.

KENZIE'S BUOYANT PADDLE-WHEEL.

-I perceive in your number for venth of the present month, u have inserted an engraving and tion of a paddle-wheel, called a 'ant Paddle-Wheel." I have to you, that some twelve years ago ited a similar paddle, and sub- the same to the Navy Board, who l the matter to the consideration ssrs. Bolton and Watt, "who that they had contemplated the n of such an arrangement many rior to that date, but more mature ration had led them to doubt its cy"; and here the matter dropped.

am, Sir,

Your obedient Servant,

JOHN BARTON.

, Nov. 23, 1837.

SUBSTITUTE FOR GOLD LEAF.

Sir,—I lately saw, at Stratford, Essex, a specimen of writing, in imitation of gold, which I think should be more publicly known than it is; with that view I crave a small space in your valuable journal. The advantages over the present method of leaf gilding on show boards, &c., are cheapness, durability, and the maintaining of its color; together with expeditious performance of out-door work, in blowing weather, and which latter, with its resistance to the action of sea water, would render it very valuable in marine work.

It is a metallic composition, which the inventor (Mr. Wilson), informs me he has been some time in bringing to perfection; and he referred me to several large boards and shop fronts in the city, which have been written with this imitation, and have stood the test of the weather for upwards of twelve months without tarnishing: my examination and inquiry upon these, are so satisfactory, as to determine me to have my order executed in the new way.

It does not look so brilliant as gold leaf does for the first few days, but as the imitation admits of varnishing, it retains its original degree of lustre.

I am, Sir,

Your very obedient servant,

I. H. B.

Thames-street, October, 1837.

MORE SYMPTOMS OF THE DECLINE OF SCIENCE.

The number of the "Bibliothéque Universelle de Genéve" for September, affords a melancholy proof of the continued decline of science in our unhappy country. This work is divided into two departments, literary and scientific, and the latter need only be referred to, to convince the most sceptical of the unfortunate fact. It contains in the whole seventeen articles, out of which number no more than *eight* refer to scientific researches conducted by British philosophers; although it is some little consolation to reflect, that the whole of the remaining nine are not contributed by the *savans* of the continent, but that three are derived from Anglo-American sources. It results from this, that the majority in favour of British science (tell it not in Gath!) over that of the continent, in a

continental journal, is no more than *two!* It is rather singular, too, that one of the foreign papers, is a review of an essay on the mineral waters of St. Gervais, in Switzerland, which, although in reality written by a Swiss doctor, was palmed off on the reading public of Geneva as the production of an English nobleman!

HEATING RETORT BEDS.

Sir,—Mr. Evans the superintendant (not engineer) of a considerable gas establishment, (the duties of whose situation render his character of importance), has been "pointed out" by Verax, as the inventor of a system of generating coal gas, which in its operation has entailed immense loss and in many cases, actual ruin to several gas companys. I however, take upon myself the pleasing task of exonerating this gentleman from the imputation.

The destructive and ruinous principle of heating a bed of small retorts by two furnaces, (instead of one) was in use long before Mr. Evans was acquainted with the properties of inflamable gas. This correspondent was shown, as he expresses it, over the establishment of the chartered company by the foreman, and in the limited space afforded in this view, he discovered that "a less quantity of fuel was consumed by two furnaces than by any method of setting he had seen."

Permit me, Sir, to remark, that this rash conclusion could not have been formed upon mature observation; neither is it possible that any one could have an estimate of even the probable amount of fuel consumed under the circumstances of merely being shown over a gas establishment.

PINDAR'S SON.

November 21, 1837.

ANSWER TO HOMO'S HOROLOGICAL QUESTIONS.

Sir,—I am sorry to observe that my brother craftsman has not given you a true solution of the question proposed by Homo in your Number 741. The question does not involve any great difficulty, and may be arithmetically solved (perhaps more elegantly by algebra) as follows.

Since there are evidently eleven conjunctions in the hour and minute hand in twelve hours; now at nine o'clock the minute hand is fifteen parts, of which the whole dial plate contains sixty, in advance of the hour hand. Consequently, $15 \times 12 \div 11 = 16\frac{4}{11}$ minutes; that is, at $16\frac{4}{11}$ minutes past nine, the two hands will be in opposition: also $30 \times 12 \div 11 = 32\frac{8}{11}$; hence, at $32\frac{8}{11}$ minutes past nine, the hands will be at right angles to one another, and $45 \times 12 \div 11 = 49\frac{1}{11}$; hence, the two hands will be in conjunction at $49\frac{1}{11}$ minutes past nine; and these are the exact answers to the first part of Homo's question; and they do not differ much from those of the Journeyman Clockmaker.

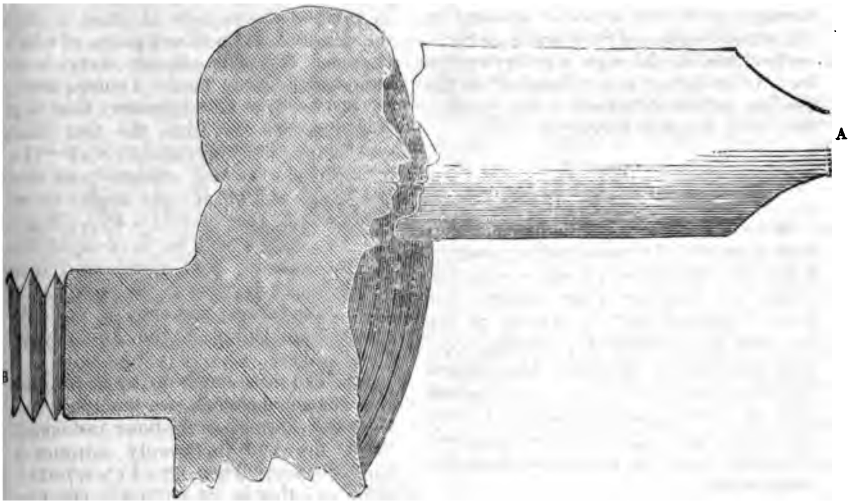
2d. The three hands being in conjunction at twelve o'clock, we shall first consider the times when the hour and minute hands are 120° (or twenty minutes in time) asunder. Then, $12 \div 11 \times 20 = 21\frac{9}{11}$ minutes; that is, at $0^h\,21\frac{9}{11}{}^m$, the hour and minute hands will be 120° asunder; and $12 \div 11 \times 40 = 0^h\,43\frac{7}{11}{}^m$ will be the next period when they are 120° distant from one another; in the same way (omitting the conjunctions) the remaining times at which the two hands are $\frac{1}{3}$ of the whole circumference asunder will be $1..27\frac{3}{11}$, $1..49\frac{1}{11}$, $2..32\frac{8}{11}$, $2..54\frac{6}{11}$, $3..38\frac{2}{11}$, 4.0, $4..43\frac{7}{11}$, $5..5\frac{5}{11}$, $5, 49\frac{1}{11}$ $6..10\frac{10}{11}$, $6..54\frac{6}{11}$, $7..16\frac{4}{11}$, $8..0$, $8..21\frac{9}{11}$, $9..5\frac{5}{11}$, $9..27\frac{3}{11}$, 10, $10\frac{10}{11}$, $10..32\frac{8}{11}$, $11..16\frac{4}{11}$, $11..38\frac{2}{11}$ respectively. We have only now to consider the different positions of the second hand at the above periods. 1st, at $0^h\,21\frac{9}{11}{}^m$, the second hand has made $21\frac{9}{11}$ revolutions, now $\frac{9}{11}$ of a revolution of the second hand contains $49\frac{1}{11}$ parts, of which the whole dial plate contains 60; hence, $49\frac{1}{11} - 21\frac{9}{11} = 27\frac{3}{11}$ parts; that is, the second hand is $27\frac{3}{11}$ parts before the minute hand. But in the case of a trisection, it should only have been twenty parts before the minute hand. Therefore, the dial plate will not be trisected at the first period $0^h\,21\frac{9}{11}{}^m$. Pursuing the same plan, we find that at none of the calculated periods, when the hour and minute hands are 120° asunder, will the dial plate be trisected by the three hands.

I am, Sir, &c.

A JOURNEYMAN CLOCK MAKER.

Edinburgh, Nov. 29, 1837.

MODE OF TURNING PROFILE LIKENESSES.



Sir,—As a constant reader of your Magazine I frequently receive valuable hints in my favourite pursuits of mechanics and turning, and am equally willing to communicate to your readers anything that may occur to me, while thus amusing myself. I now send you an easy method of turning the profile of any person, which can be accomplished by any one who can handle a file. It is as follows:—

Having obtained the desired profile, file a chisel as shown in the sketch until it fits the profile, as the iron of a moulding plane fits the moulding. Turn with it what may be termed a handle or knob for drawers, which, when done, may be sawn into slices and given to your friends. In the sketch, A represents the chisel, and B the knob as having had many slices sawn from it. If this has ever been done before, by any other person, I am not aware of it. My mandril having a female screw, I am obliged to screw the piece into it; but with a male screw, the operation can be done much neater.

I am, Sir,
Your humble servant,
JAMES WILCOX.

Hormead cottage, near Buntingford, Herts.

THEORY OF THE SPINNING TOP.

(From the *Liverpool Mercury*.)

Sir,—As you have introduced the subject of the spinning top, you will perhaps allow me space for a few remarks on the same TOP-ic. I agree with you that it is by no means a frivolous object of investigation or experiment, especially if you refer to the theory of its motion. It has occupied, and has puzzled, many able men. It is extremely difficult to say, why a top stands at all. I have heard the late Sir John Leslie say that the subject was one of the most difficult in Natural Philosophy. He had a very excellent one, running upon agate, for the same purpose as Troughton's. It spun a long time, but I am not certain as to the exact time. Dr. Arnott in his admirable, though not always correct work, on Physics, thinks he has discovered the true cause, and considers it so important as to point it out in the preface among his "specimens of new disquisition or suggestion." He very correctly points out (page 64 of the third edition) the futility of the cause usually assigned "even in philosophical treatises of authority." "Some persons believe," he says, "that a spinning top in a weighing scale would be found lighter than when at rest; and many most erroneously hold that the centrifugal force of the whirling, which of course acts directly away from the axis, and quite equally in all directions, yet, when the top inclines becomes greater upwards

than downwards, so as to counteract the gravity of the top." This, though the current opinion, is no doubt erroneous enough; but, in attempting to give the true reason, the author falls into an error equally fallacious. "While the top," to use his own words, "is perfectly upright, its point, being directly under its centre supports it steadily, and, although turning so rapidly, has no tendency to move from the place: but if the top incline at all, the *side* of the peg, instead of the very point, comes in contact with the floor, and the peg then becomes a little wheel or roller, advancing quickly, and, with its touching edge describing a curve, somewhat as a skaiter does, until it comes directly under the body of tbe top, as before." This is liable to three objections: first, that a cylinder, inclined to one side, and rolling round upon one end, never would roll towards the centre, but rather from it: second, the cause would cease, and the top would immediately fall whenever any small hollow confined its point to one spot, as is frequently the case: and third, if the standing of the top depeded on the width of the point, it would follow that, the finer the point the more difficult it would be to keep up the top, and if the peg could be ground to a mathematical point, the top would invariably and instantly fall: but the least observation shows that the tendency to fall is, in mathematical language, no function of the fineness of the point; who ever saw a top spin worse for having a fine point if the floor were sufficiently smooth and hard?

Before any attempt to give a theory of its motions, it would be well to observe carefully what those motions are—how far essential, and how far accidental—and also to institute experiments to discover in what manner the different motions are effected by a change of circumstances. We shall find, then, that a top has four distinct motions,—1st, a *rotary motion* on its axis, corresponding to the diurnal motion of the earth, and of course essential; 2nd, an *erratic motion*, corresponding partially to the earth's annual motion; this motion depends on the thickness of the point, and is, of course, not essential, since it may be confined: 3rd, a *conical motion of its axis*, in which the top of the axis slowly describes a circle altogether differing from the rotary motion, and keeping no time with it: it corresponds exactly to the well known conical motion of the earth's axis, completed in the long period of 25,000 years, and occasioning the precession of the equinoxes; this motion is slowest when the rotary motion is most rapid, and quickens as the latter diminishes; it is slowest, also, in those tops which have the shortest pegs, and ceases altogether when the centre of gravity is brought as low as the point of the peg: this motion is, of course, essential, so long as the centres of gravity and of motion do not coincide: there is also a fourth motion, which will almost invariably be found to some extent, though altogether contingent and depending, I suspect, upon the imperfection of the mechanism, viz., upon the load, and being equally poised on every side of the centre of motion: it is a minute circular movement of the axis describing a coil of very small circles around the circumference of the circle described by the 3rd motion; it very prettily illustrates the motion called in astronomy the *nutation* of the earth's axis, except that it differs from it essentially in its rapidity, being concomitant with the first motion.

From what I have said it will appear that there is some harmony between the motions of a top and those of the planetary bodies. Sneer at tops who will, the earth itself, as to its motions, is nothing else than a large spinning top; and any one attempting either to give or to obtain a clear idea of the various planetary movements will find the top a most useful auxiliary. It is remarked by Sir J. Herschel, in his volume on astronomy in Lardner's Cyclopædia,—(Art. 266) —that a "child's peg-top, or te-totum, when delicately executed and nicely balanced, becomes an elegant philosophical instrument, and exhibits, in the most beautiful manner, the whole phenomenon (of the precession of the equinoxes) in a way calculated to give it at once a clear conception of it as a fact, and a considerable insight into its physical cause as a dynamical effect." But, unfortunately for this purpose, the motion is always in the wrong direction, being *along with*, instead of *contrary to*, the direction of the rotary motion. The question arises, how is this to be accounted for, or can it be obviated? It appeared to me, that, since this motion is retarded by shortening the peg and lowering the centre of gravity, it would cease altogether if the centres of motion and of gravity were made coincident, and, upon further extending the same change, which gradually annihilated the positive motion, that motion would reappear negative. I had, therefore a top constructed with an axis capable of being raised or lowered at pleasure by means of a screw: it was made to spin in a very small glass cup, fixed on a narrow stem, and, a conical hole, cut in the bottom of the top, permitted the cup to be raised within the top above its centre of gravity. This I found exactly to answer my expectation, it permitted the motion to be quickened, retarded, annihi-

reversed at discretion, and, in faet, s usual wild vagaries and brought o perfect control. As it was con- one spot, I could fix a wooden circle for the ecliptic, a thin rim of lead its equator. I could then make it any degree of inclination of the les that I chose, and, by lowering re of gravity a little below the f motion, I could then show the notion of the axis and the two equi- points slowly moving in a *contrary* to the top, and taking as much r ten minutes to describe a single n. If the point is fine the inclina- the equator to the ecliptic will be l without any apparent diminution, not, the inclination will gradually until the top attain a vertical posi-

s means, with a few additional con- , we may illustrate almost every as- al movement. The top, with its ay be carried where we please, or uspended by a long string, to show h's annual revolution, while the tions are going on at the same time. ng will of itself almost invariably elliptic rather than a circular orbit, uspended from the hand, a delicate of the finger will show the advance arth's apsides. If, again, we sub- or the body of the top two balls at- each other or to a heavy ring, we show the relative motions of the d moon, the retrogradation of the nd all the phenomena of eclipses. tions of the top, however, not only those of the planets, but appear *depend upon the same causes*; and n persuaded that the same theory on hey depend may be made even to if not practically to illustrate, the unsolved problem of the eccentric ms of Saturn's rings and the stabi- heir equilibrium.

be remarked that I have not explain- all, what I concieive to be the true the top's standing, but I have been f encroaching too far upon your nd must reserve that for a future oc- f my communication should be ac- . In the meantime, if any one to construct a top such as I have d, and to remark the peculiar mo- ich I have pointed out, he will have e first step towards discovering for the real cause.—Yours, &c.

JAMES ELLIOT.

llow-street.

—I shall be happy to show the top constructed to any person who may *interest in the subject.*

NEW PLOUGHS FOR DIGGING AND SEPARATING POTATOES.

The following letter has been received by the Central Society, from Colonel Le Couteur, of the Royal Jersey Militia, and Aid-de-camp to his late Majesty, William the Fourth. Colonel Le Couteur was unanimously elected honorary secretary for foreign correspondence at the last annual meeting of the Central Society, and among other valuable services rendered by this gentleman to the agricultural body, may be included the encouragement he has given to the inventor of a plough, which promises to prove a highly valuable addition to farming implements. The description of this implement by Colonel Le Couteur, after actually experiencing the application upon his own farm, will be found well deserving of attention.

"Belle Vue, Jersey, Oct. 30, 1837.

"Dear Sir,—I lose no time to make you acquainted for the information of the committee at its next meeting, with what I consider to be a most important and valuable invention, one which may become of general utitity to the agricultural world.

"It is the construction of a plough for digging potatoes, or separating them from the soil, which has recently been made by Mr. John Le Boutillier, an ingenious young smith of this island.

"He had invented a light one horse plough for me, which only weighs 58lbs., about two years ago, for planting potatoes, of a simple and efficient form, which traces a narrow furrow, in and along which women or children deposit the potatoe set at any given depth; when the next turn of the plough throws the earth 18 inches off, and neatly and completely covers the sets and furrow that had been planted, making at the same time a new furrow; this is an admirable improvement, as it saves the labour of one horse besides that of one turn of the plough at each furrow; (formerly it required two turns of the plough to plant one furrow,) thus enabling the farmer to plant double the land he formerly did in the same time at half the expense of horse labour. I then told Mr. Le Boutillier that as he had invented so excellent an instrument for planting potatoes, I hoped that he would soon show me one as simple and efficient for taking them up; I little thought that he would so readily achieve this desirable end.

His new plough was at work on my farm all day last Thursday, and turned out half an acre of potatoes in five hours, drawn by three horses working at an easy peace without stopping, which, considering the novelty of the invention, the number of persons who

came to see it, and the interruption thus occasioned, was good work.

"It has the breast of an ordinary Jersey plough; on the inner side of it is a large circular wheel, which rolls on the bottom of the furrow with teeth, which catch the ground as the wheel rotates; this gives motion to a small catch wheel with cogs, that drives a lesser one which turns a shaft, to which are attached four short arms with paddles; these paddles as the plough advances, revolve with considerable velocity, catch all the earth, potatoes, or weeds, that may be brought over the breast of the plough, and throw them off five or six feet in a perpendicular direction from the plough, leaving the ground quite comminuted and level. This does away in a great measure with the necessity of having then to fork out the potatoes, and will enable nearly all the hands to be employed in merely picking up and sorting them.

"It is not only for potato digging that I consider this invention important in some of the dry stiff soils, that require to be finely divided and comminuted; where fallows are to be broken up, or for intermining ashes, soot, lime, or any powdered manure with the soil, it is the most effective instrument that has been devised.

"As a first invention, it is very complete, but it will be greatly improved by the mechanics in England the moment it is seen; the merit of the invention lies with the individual I have named above. He has received a small premium for it from the agricultural society in this island; but I should hope that it may come within the scope of the duties of our central committee to order a plough of each sort as patterns, at the cost of 3*l*. 10*s*. for one, and 1*l*. 10*s*. for the other; and if approved when tried, to award this ingenious young man some premium for two so novel and valuable inventions.

"I trust the committee will consider me to have acted within the sphere of my duty in making them acquainted with what appears to me likely to become essentially useful.

"I remain, dear Sir, yours, very truly,

"J. Le Couteur,

"Hon. Secretary for Foreign Correspondence.

That the agricultural body may benefit if they please by the researches of Colonel Le Couteur, who has expended both time and money to a considerable extent, and exhibited no ordinary talent in practically and scientifically investigating the varieties and properties of wheat, his valuable work on this subject may be safely recommended to the attention of every farmer in the kingdom.—*Bell's Messenger*.

AUTOMATON VIOLINIST.

After the extraordinary performance of Paganini and Ole Bull, our readers will not be surprised at any new development of the powers of this instrument however great; but there are few in the world who will hear without wonder and admiration of the unequalled performance of Monsieur Mareppe's automaton violin player, which was recently exhibited before the Royal Conservatory at Paris. Our informant, M. Bruyere, who was present, thus describes this wonderful piece of mechanism:—"On entering the saloon, I saw a well dressed handsome figure of a man, apparently between forty and fifty, standing with a violin in his hand, as if contemplating a piece of music which lay on a desk before him; and had I not gone to see an automaton, I should have believed the object before me to have been endowed with life and reason, so perfectly natural and easy were the attitudes and expression of countenance of the figure. I had but little time for observation before the orchestra was filled by musicians, and on the leader taking his seat the figure instantly raised itself erect, bowed with much elegance two or three times, and then turning to the leader nodded, as if to say, he was ready, and placed his violin to his shoulder. At the given signal he raised his bow, and applying it to the instrument produced *à la Paganini*, one of the most thrilling and extraordinary flourishes I ever heard, in which scarcely a semi-tone within the compass of the instrument was omitted, and this executed with a degree of rapidity and clearness perfectly astonishing. The orchestra then played a short symphony in which the automaton occasionally joined in beautiful style; he then played a most brilliant fantasia in E. natural, with accompaniments, including a movement allegro mollo on the on the fourth string solo, which was perfectly indescribable. The tones produced were like any thing but a violin; and expression beyond conception. I felt as if lifted from my seat, and burst into tears, in which predicament I saw most persons in the room. Suddenly he struck into a cadenza, in which the harmonics double and single, arpeggios on the four strings, and saltos for which Paganini was so justly celebrated, were introduced with the greatest effect; and after a close shake of eight bars' duration, commenced the coda, a prestissimo movement played in three parts throughout. This part of the performance were perfectly magical. I have heard the great Italian, I have heard the still great Norwegian, I have heard the best of music, but a never heard such sounds as then saluted my ear. It commenced p p p, rising by a gradual

crescendo to a pitch beyond belief; and then by a gradual motendo and colendo died away, leaving the audience absolutely enchanted. Monsieur Marreppe, who is a player of no mean order, then came forward amidst the most deafening acclamations, and stated that emulated by the example of Vaucouson's, flute player, he had conceived the project of constructing this figure, which had cost him many years of study and labour before he could bring it to complction. He then showed to the company the interior of the figure, which was completely filled with small cranks, by which the motions are given to the several parts of the automaton at the will of the conductor, who has the whole machine so perfectly under control, that Monsieur Marreppe proposes that the automaton shall perform any piece of music which may be laid before him within a fortnight. He also showed that to a certain extent the figure was self acting, as on winding up a string, several of the most beautiful airs were played, among which were " Nel cor piu," " Partant ponr la Syrie," " Weber's last Waltz," and " La ci d'arem la mana," all with brilliant embellishments. But the *chef d'œuvre* is the manner in which the figure is made to obey the direction of the conductor, whereby it is endowed with a sort of semi reason."—*Galignani's Messenger.*

STEAM FIRE EXTINGUISHER AND SMOKE PROTECTOR.

Mr. Wallace's plan of extinguishing fire by means of steam, and his smoke protector, were made trial of on Wednesday last, on board the James Ewing steam-boat, in presence of Mr. Turner, Baillie of the river, and a number of other gentlemen. We have received the following communication from a correspondent on the subject:—

I had, on a former occasion, an opportunity of examining the smoke protector along with Professor Thomson; we were highly satisfied with the principle, and, after seeing a trial made, the Professor gave his opinion of it to Mr. Wallace in writing, approving both of the principle and practice of the smoke protector. I think it may be the means of saving many lives and much valuable property from that destructive element, and shall state the different trials, or experiments, as they took place on Wednesday, the 8th instant.

First Experiment.—A tar barrel, containing a little tar, with some peats and green wood, was placed at the bottom of the hold, a shovelful of burning coals was put into the barrel, and above them was placed a quantity of wet hay and straw; a pipe was the fixed in the centre of the barrel with the other end upon deck, and fixed to a pair of large bellows, which, when blown on the burning coals, peats, tar and hay, raised a tremendous smoke in the hold containing all the chemical agents such as pyroligneous acid, &c. so pernicious to animal existence, that no individual could have breathed in it with impunity for a single minute. One of the men belonging to the steam-boat descended the ladder to the hold, equipped with the smoke protector; the hatches were immediately closed upon him, and he remained there twenty-one minutes without feeling the least inconvenience from the smoke, and, when called upon deck, he said " he could have remained other ten minutes longer."

Second Experiment.—A large fire was again kindled in the hold and the hatches again closed; the fire was allowed to burn till the flames nearly reached the deck, when steam was conveyed into the hold by means of canvas pipes, attached to a cran purposely placed in the boiler of the steam-boat. The cran was no sooner turned than the steam rushed along the pipes, and in two minutes the hold of the vessel was filled, the flames subdued, and in four minutes the fire was completely extinguished.

Third Experiment.—A fire was again fully kindled in the hold, when one end of a canvas pipe was fixed to a water pump, and at the other end of the canvass pipe was fixed a small tin pipe about four feet long, and drilled at the extremity with very small holes; a man, dressed with the smoke protector, took this pipe in his hand, which was supplied with water from the pump and forced out at the small holes; the man then moved the end of this pipe backward and forward quickly on the fire so as to make the fire convert the water into steam, which soon filled every corner of the apartment and thus showed clearly that the devouring element might be made available to extinguish itself where water could not be practically applied in sufficient quantities. The man continued to sprinkle water so long as any steam was raised by the fire, which was thus extinguished in about seven or eight minutes.

Fourth Experiment.—James Tassie, Esq., proprietor of the vessel, proposed that fire should again be raised as large as possible, so as not to hurt the deck of the vessel, and allowed to burn, to see how long the man, dressed with the smock protector, could stand in the hold under all the disadvantages of smoke and excessive heat. The man, equipped with the smoke protector and dress, as formerly described, went

into the hold with the flames nearly reaching the deck, where he remained fifteen minutes, when he was called out by Mr. Tassie, who declared himself highly satisfied with the experiment, as also did all the gentlemen present. When the hatches were opened the fire was burning strongly. John Buchanan, 16, George-street.

Another trial of Mr. Wallace's smoke protector was made this day (14th Nov. 1837,) in an empty house in College-street, before a number of gentlemen, among whom we observed Mr. Millar, Captain of Police, Professor Thomson, John Anderson, Esq., Manager of the Castle Steam-boat Company, taking deep interest during the time of the experiment, and, when it was over, they expressed themselves highly satisfied with his plan of the smoke protector.

The house was filled with smoke as densely as could possibly be raised, when a person went in with the smoke protector; the door was closed on him where he remained twenty-two minutes when he was called out to receive a fresh supply of water, which he got, went in again and extinguished the burning materials.—*Glasgow Reformer.*

MITCHELL'S PATENT SCREW MOORINGS.

This mooring is constructed on the principle of the screw, but differing essentially in form from that well-known instrument, for as the spiral thread makes little more than one turn round its shaft, it is at the same time extended to a very broad flange, the hold which it takes of the ground being proportional with its breadth of disc. Where it is necessary to provide against a very heavy strain, the moorings used are three feet six inches in diameter, and the principle is capable of still further extension. A mooring of the above diameter presents a resisting surface equal to about ten square feet, whereas the palm of the largest anchor in the British navy does not exceed half that size, and some estimate of its holding powers may be formed, when it is shown that this broad surface can be screwed to a depth, many times greater than that to which the palm of an anchor can ever descend. The method of laying down the mooring is briefly thus: a strong mooring chain being so attached to it as to allow the screw to turn freely, without carrying the chain round with it, a powerful iron shaft is then fixed firmly in the upper part of the mooring, which is formed square for that purpose, setting in the same manner as a key to a harp or piano forte in winding up; it is then lowered by the mooring chain, joint after joint being added to the shaft until the mooring has reached the ground; light levers of twelve feet in length are then applied to the shaft in the manner of a capstan, when the operation of screwing the mooring into the ground commences. Two boats or barges having been moored firmly, head and stern, close alonside each other, and the upright shaft rising between them about midships, the men place themselves at the bars, and moving round from one boat to the other, the two giving them a safe and convenient platform, and by a simple contrivance, the levers are occasionlly shipped upwards as the screw and shaft sink into the ground. When the number of men employed can no longer force the screw round, the levers are removed, and the shaft is drawn out of the ground, leaving the mooring firmly imbedded, with the chain attached to it, and a buoy being shackled to the other end of the chain, the work is completed.—*Civil Eng. and Architects' Jour.*

CURIOUS DISCOVERY OF ANCIENT PIECE GOODS AND MANUFACTURED STUFFS.

It is more than a thousand years since Theodolphus Bishop of Orleans, gave to Notre Dame du Pays en Velay a beautiful manuscript, containing the ancient Testament, the chronography of St. Isador, and other pieces, the whole distributed into 138 articles. He made this gift in gratitude for his deliverance from the prison of Angers, where he was confined in 835. It was on Palm Sunday that year while Louis Le Debonnaire was passing, that he began to sing a well known Canticle, which the Catholic Church has since then introduced into its ceremonies. This precious manuscript, in a state of perfect preservation, is to be seen any day in the archieves of the Bishopric of the Puy en Velay, department of the Haute Loire. A portion of the manuscript is written on leaves of parchment, in letters of red and black, intermixed with some of gold. The other portion is written on leaves of parchment, dyed purple with letters of gold and silver, among which are observed ornaments of different kinds and different colours, designed in the Bysantine style. This manuscript, which is remarkable for its beauty and its preservation, is still more remarkable for the manufactured stuffs of different descriptions which it contains. When Theodolphus composed his manuscript, with the intention of preserving the gold and silver characters from contact and friction, which in time would have tended to displace and obliterate them, he placed between each page a portion of the manufactured tissues peculiar to the era

when he lived. These examples of the silk and other piece goods of the time are thus curiously preserved. Till lately little attention was paid to these tissues, which are principally of India manufacture, and which bear scarcely any analogy to the products of the modern loom. Some are Cachemire shawls of those patterns which the French call *brouche* and *espouline* and made in the Indian fashion, but with this difference, that they are limited to four colours, and demonstrate the greatest antiquity by the primitive simplicity of their colours and design. Others are crapes and gauzes, against the luxury of whose transparent tissues the fathers of the Church at that time so perseveringly fulminated their censures. The rest consist of muslins and China crape of exquisite beauty. The components of the majority of these tissues consists of goats' or camels' hair of exceeding delicacy and fineness. Like the manufactured stuffs of ancient Egypt, painted on the walls of its palaces and tombs, or substantially preserved amidst the envelopes of mummies, the designs are limited to four colours, which are in fact the four sacred colours of China, India, Egypt, and the Hebrew Tabernacle. Nevertheless, the Egyptian designs which are identical with those of India, are many of them of exquisite beauty. The consummate skill of the silk and cotton manufacturers of ancient Egypt 4,000 years ago, the beauty and richness of their fabrics—and the little alteration which has taken place in the economy and machinery of the factories, as well as in their product, has been recently demonstrated in the great work of Champollion. All the the details of the silk and cotton factories of Egypt, under the Pharoahs of the 18th dynasty (which then monopolized the commerce of the world, and which sent a colony of weavers from the overburthened population of Lower Egypt to found Athens, and the subsequent civilization of Europe and this country) are laid open with vivid accuracy in that splendid work, and brought with all their startling analogies before the eye of the modern reader by the drawings from the temples, palaces, and tombs which it contains. It proves, indeed, that there is "nothing new under the sun."—*Galignani.*

NOTES AND NOTICES.

Completion of a Thames Tunnel.—On Wednesday last Mr. Hoofe, the architect of the West Middlesex Water-works under the Thames at Chiswick, performed the ceremony of opening the works by passing through the aperture himself, together with his three sons. The tunnel is formed of 68 pipes, each of which is nine feet long and three in diameter, and conveys water to Middlesex from Surrey, where there are reservoirs, thirty acres in extent, for the purification of that important article. Mr. Hoofe has the merit not only of having projected and accomplished this work, but of being the first man that ever walked under the Thames, part of which task he was obliged to perform on his hands and knees. The time occupied in passing through was eight minutes and a quarter.

Patent Bricks.—Bricks made by machine, for the invention of which a patent was some time ago obtained by an American gentleman, named Bakewell, are now very extensively employed in the erection of new buildings in this neighbourhood, especially for houses of a general cast. Their dearness will, no doubt, prevent them from superseding the common bricks for some time; but though the expense of fronting an ordinary dwelling-house with patent bricks, adds a few pounds to the total expense. this is more than balanced by the superior beauty and durability of the material.—*Bolton Free Press.*

Dr. Clanny's Improved Telegraph.—No machine for making signals or numerical symbols can, with propriety be called a Telegraph, unless it be adapted to express a sufficient number of letters so as to form words, not only in one, but also in every written language, and by which words and sentences may be formed expeditiously. We have much pleasure in stating to our readers that Dr. Clanny, of Sunderland, has so improved his Telegraph, that the advantages hinted at above are now completed, and at the trifling expense of fifty shillings for each station, if the station be ten or even twenty miles. This Telegraph is not to be patented.—*Newcastle Journal.*

Gunpowder Engine.—After years of labour, and many disappointments, sustained only by patience and perseverance rarely equalled, Mr. J. Smith, of Dysart, has completed a machine, which he terms a gunpowder engine, and which moves with great ease against a weight of twenty-six hundred weight on the square inch of the piston equal to a column of water a mile and a quarter high. And yet, with this enormous power, the machine is so perfect that not a particle of leakage proceeds from any part of it. Nor is it possible to increase this power by any effort of the person to whose care the machine may be entrusted—a circumstance which renders it perfectly safe. Mr. Smith calculates the saving in the use of his machine as compared with steam, to be fully eighty per cent., whilst the space it occupies is not one-twentieth of that taken up by the steam-engine.—*Caledonian Mercury.*

Caoutchouc Rick Cloths.—A new covering for hay, straw, &c. has been presented to the Agricultural Society of Paris, which has been found to answer exceedingly well during the late heavy rains, not only in propelling the wet, but having also the desirable quality of preventing insects from depositing their ova. This covering, which is very simple, consists of a piece of strong canvass, similar to that used for ships' sails in the shape of a marque, well saturated with a dilution of Caoutchouc or Indian rubber, with spirits of common turpentine. It renders the canvass quite impervious and more elastic, and the preparation can be made at a trifling expense. The French Government, wishing to make a trial of it at the late camp of Compeigne, had several of the soldiers' tents prepared with it; and from the report of a Board of officers appointed to make the experiment, it has proved so efficacious in repelling the damp, that it is to be adopted throughout the French army when encamped.

The Fulmifer.—On the 20th of October an interesting experiment was tried at Pella, near St. Petersburgh. Two blocks of stone which from time immemorial have obstructed the free navigation of the Neva at this spot, were blown up by mines which were sprung under the water by means of the Fulmifer invented by Mr. Le Molte. The persons who were present at this experiment were astonished at the power of the machine, which can easily be transported from place to place, and set in activity at any time. The Fulmifer gives out an electric

spark which forces its way through earth and water to the required distance. In spite of the moisture which prevailed in the atmosphere on the day of the experiment, which appeared unfavourable to the developement and diffusion of electricity, the Fulmifer, though it had been six hours in the rain, overcame all obstacles. How important the invention of the Fulmifer may become, especially for river-navigation, by removing the obstruction of rocks and stones has been shown by this experiment. Three hours before it was made a richly laden vessel suffered shipwreck on one of these very stones.—*German Paper.*

The British Museum.—Within the last few weeks two additional rooms have been thrown open to the public at the British Museum: they are on the upper story, immediately over the new Egyptian Gallery, and are themselves almost entirely occupied with an extensive collection of minor Egyptian antiquities, partly acquired by purchase at the sales of Messrs. Salt and Sams, partly presented by Mr. Wilkinson the traveller, an indefatigable benefactor to the Museum. Implements of all sorts and sizes, articles of clothing, domestic utensils, household ornaments, &c. &c., are arranged in a series of glass cases extending along the walls; and in isolated glass cases in the middle of the room are exhibited the mummies, from the tombs of which the other antiquities have in general been taken. The collection of Etruscan vases purchased from M. Durand is also placed in the same rooms. There is no building at present carrying on at the museum; the last Parliamentary grant is being exclusively applied to the interior finishing and fitting up of the northern range of building which is to contain the general library, the reading-rooms, the gallery of natural history, &c. When these rooms are completed and occupied the destruction of old Montague House is to commence.

Electric Telegraphs.—Many claimants for this invention (says the *Scotsman*) are now coming forward; but the following extract sent us by a friend from a well-known work, will show that the idea of such a mode of communication was conceived and experimented upon fifty years ago:—"In the evening to Monsieur Lomond, a very ingenious and inventive mechanic * * * In electricity he has made a remarkable discovery; you write two or three words on a paper; he takes it with him into a room and turns a machine enclosed in a cylindrical case, at the top of which is an electrometer, a small fine pith ball; a wire connects with a similar cylinder and electrometer in a distant apartment; and his wife, by remarking the corresponding motions of the ball, writes down the words they indicate, from which it appears he has formed an alphabet of motions. As the length of the wire makes no difference in the effect, a correspondence might be carried on at any distance—within and without a besieged town, for instance—or for a purpose much more worthy, and a thousand times more harmless, between two lovers prohibited or prevented from any better connection. Whatever the use may be, the invention is beautiful."—p. 79, vol. I., 4to *edition of Arthur Young's Travels in France. May* 1787.

Mr. Crosse and his Insects.—Not long since a good deal was said and written respecting Mr. Crosse's supposed production, or reproduction, of insects. The subject, however, notwithstanding the zeal of the credulous, would probably, ere this, have sunk into oblivion, but for an occasional letter from Mr. Crosse himself, which somehow or other gets into the papers: there is one just now going its rounds, with which, it appears, he forwarded to a friend "a small bottle of spirits of wine, containing about thirty insects, *produced* in silicate of potash, under the long-continued action of weak voltaic electricity," and in which he expresses himself "as much surprised, and quite as much in the dark, about the affair as at first." Now it was possibly an extract from this very letter, accompanied by this very phial of insects, which was lately submitted to the Academy of Sciences at Paris; and it would therefore have been more ingenuous, had the public been also informed that the *savans* thought the subject wholly unworthy even of consideration:—here is their decision: "*L'Académie ne juge pas que cette communication doive être l'objet d'un rapport.*" One of the members, however, M. Turpin, made some observations on the insects themselves, which he had examined out of curiosity, although he entirely concurred in the opinion, that the subject of the communication was wholly beneath the serious consideration of the Academy. He had, he said, examined the insects with a microscope multiplying 280 times the diameter, and they appeared to constitute a new species of the genus *acarus*; those described and figured, to which this animal belongs, are found in cheese and flour. If, said M. Turpin, Mr. Crosse believes that he has entirely formed, by the means described, an animal of so elevated an organization as that of his *acarus*, he cannot have sufficiently studied the organization and comparative physiology of living beings: the means he has employed have been merely stimulants, such as excite and favour germination in grain, and will hasten the hatching of eggs.—*The Athenæum.*

Preservation of Vegetable Substances.—It is well known that animal substances are preserved from putrefaction by corrosive sublimate, but that vegetable substances, however saturated they may be with this sublimate, discharge all the metallic salt when exposed to water. It is the gelatine of animal substances which combines with the mercurial salt, and thus forms an insoluble and imputrescent composition. A M. Tellier, in order to make the sublimate useful for vegetable matter, proposes that it should be steeped in a cold concentrated solution of sublimate, then thoroughly dried; after which it should be plunged in a warm solution of one part gelatine to eight parts of water. By this means all the salt is decomposed, and if afterwards exposed to the action of water, the latter will be strongly coloured with excess of gelatine, but affords no traces of mercurial salt.—*Ibid.*

British Encouragement of Foreign Science.—It sounds rather strangely that, just as all the world is stunned with the cry, that no encouragement is given to the production or scientific works in this country, while the other nations of Europe strive with each other which shall be foremost to reward its men of letters, the only vote of pecuniary assistance in the production of a new work at the late meeting of the British Association, was one for a grant of one hundred guineas to *Monsieur Agassiz*, to enable him to prosecute with spirit the publication of his great work on "Fossil Fish."

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MUSEUM, REGISTER, JOURNAL, AND GAZETTE.

No. 749.] SATURDAY, DECEMBER 16, 1837. [Price 3d.

IMPROVED BOOKBINDER'S PLANING MACHINE.

Fig. 2.

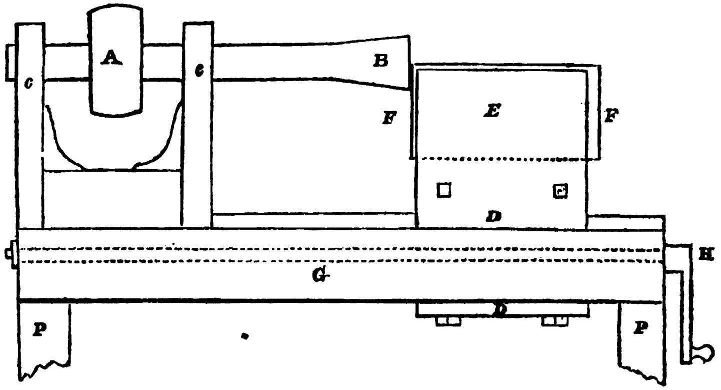


Fig. 1.

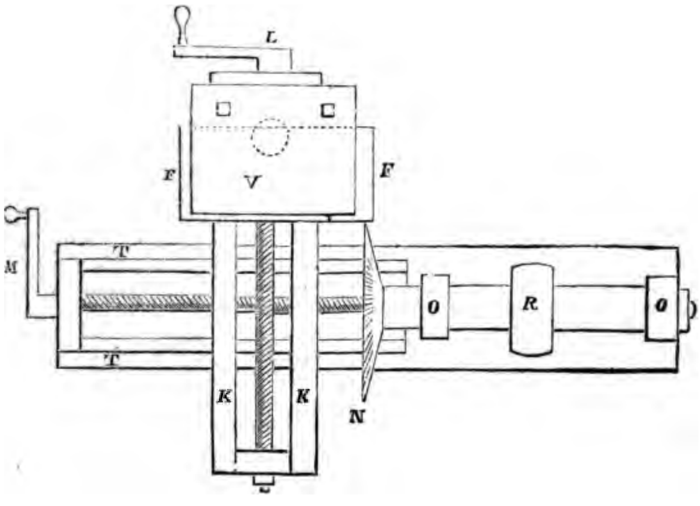


Fig. 3.

IMPROVED BOOKBINDER'S PLANING MACHINE.

Sir,—Having observed in one of your late numbers, that a patent has been taken out for improvements in bookbinding, I have thought that the method hereafter described, may be useful to the trade in general, and particularly to those engaged in the new mode of binding, by means of an elastic cement, without stitching. If you are of the same opinion, and will insert this communication in your Magazine, I shall feel obliged. Similar machinery is well known to engineers and others, and in daily use among them under the name of slide-rests, mandrils, cutters, &c.; but as bookbinders are very little conversant with lathework, I have annexed drawings to the description; a planing machine, such as is used for planing metal, may be advantageously introduced for some of the purposes of bookbinding, but I find the slides, and knives and cutter, answer every purpose, although my machine is none of the best workmanship.

A common carpenter's plane also acts very well on the edges of paper, and if the paper is pressed very hard the surface will be beautifully smooth.

Fig. 1 (see front page), a side view of the machine, for cutting the front or hollow edges of books by means of a circular cutter.

Fig. 2, a section of part of the circular cutter.

Fig. 3, a bird's-eye-view of the machine for cutting and squaring the ends of books.

A, fig. 1, a driving pulley fixed upon the circular cutter B. C C, two uprights for bearings, fixed upon the bed G, similar to a lathe. D D, a travelling slide, which mooves along the bed G, by means of the screw H; which slide carries the book E F, the latter being held in the clam E. P P shows part of the stand.

Fig. 2; a section of part of the cutter B for forming the front, or hollow edge of the book; this cutter has a passage quite through it, to allow the cuttings to pass freely off. The inside is tapered back thick, to make it strong, and is cut inside similar to a float, as shown at S; the outside is perfectly plain to cut the work even and smooth.

Fig. 3; R is the driving pulley, on the *spindle of which* is fixed the circular knife N, floated at the back. O O, two upright bearings similar to fig. 1. T T, the beds in which the screw M works, for regulating the distance of the framed beds K K, and the slide and clam V, from the circular knife. L, a screw to bring the book and slide V, up to the edge of the circular knife. On the centre of the clam, or slide V, is a pivot to admit of the book being turned, to have the other end cut without detaching it, or unscrewing the clam.

The bed G should be long enough to receive both the machines.

I am, Sir, &c.

A BOOKBINDER.

Dec. 9, 1837.

SMITH'S EVER-POINTED STONE-CUTTING CHISEL.

Sir,—Some years ago considerable alarm was excited amongst the members of the mason craft, at your announcement that the planing of stones by machinery had been at last effected; and from the description published in the Magazine (No. 636) of Mr. Hunter's stone-planing apparatus, I thought the method so likely to come into immediate use, that I suggested to many of my brother masons, the propriety of looking out for some other occupation. Many a mason had, in fact, made up his mind to throw down his mallet and chisel, and abdicate in favour of "all conquering steam" and machinery, like our fellow workmen the spinners, weavers, pressmen, and others.

Stone-planing machinery has not however, made such rapid strides as we expected, at which I confess I am somewhat surprised, as Mr. Hunter's invention, from the careful and interested exexamination I gave it, and from the reports I heard of work done by it, seemed in every way calculated to operate well; and that far cheaper than could be done by hand labour, even were our wages to be reduced to the same rate as that of the spinners and weavers.

Every invention therefore, that will give facility to performing the operation in question by manual labour, will be a boon to the masons, and enable them, for a time at least, to contend with their great rival; and this observation brings me to the object of my present letter. The ordinary chisels used for dressing and cutting

ery frequently want sharpening, is an operation requiring time, nt, and expense; having, when , to be forged and sharpened, and rds hardened and tempered. A e maker of the name of Smith in wn has lately invented an ever- chisel, which will I think soon erally adopted, provided it be heap. It is in fact an application principle upon which Messrs. 's (or rather Mr. Hawkins's) ever- pencil is constructed. A thin well tempered steel, of the width chisel required, is placed between eeks of iron, and held tightly them by means which I shall e. The point of the thin steel ng beyond the ends of the iron forms the cutting edge of the and as soon as the edge which is worn away by the friction ing the stone, the steel is ad- between cheeks, and the edge is mediately renewed. To prevent el plate from slipping side-ways, re studs on each side of it, on one ron cheeks, which go into corres- g holes in the other cheek. The is held together by a collar or slipping over, and hammered tly, the cheeks being of a wedge When the mortice or collar is properly home, a groove therein es with a groove in the cheek of el, and a wedge being put into e thus formed, holds the whole ight, and prevents the mortice ing shaken off by the blows of let.

e top of each cheek, on the inside, half worm of a screw; between screw is inserted, the end of ouches the top of the steel plate, being turned down with a screw- r otherwise, forces the steel out etween the cheeks for renewing king edge.

pe I have described the thing enough to be understood by my masons and your readers, with- aid of a drawing; my hands rough and stiff with handling the nd chisel, and moving our hard tone to attempt the draughtsman.

I am, Sir, yours respectively,

A STONEMASON.

Yorkshire, Nov. 28, 1837.

PINE-APPLE CAMBRICS, ETC.

The vegetable kingdom is yet replete with substances, which will in process of time be brought into use as materials for various useful purposes. Many plants have already been experimented upon as regards the strength and other qualities of the fibre of their stalks and leaves; some have already been rendered subservient to our manufactures, and others have been abandoned. A correspondent has called our attention to the application of the fibrous parts of the leaves of the pine-apple plant, (after being prepared by bruising, boiling in an alkaline solution, rinsing, and drying), to the purposes for which hemp, flax, cotton, and the like kinds of materials are used; such as for weaving cambrics and other stuffs, making ropes, thread, paper, &c. This invention has been patented by a gentleman of the name of Zinke. Our correspondent further informs us that he has examined some specimens of cambric manufactured from the prepared fibre of the pine-apple leaf, and that it appears of finer texture than that usually manufactured from flax. The fibre is of extreme fineness, rivalling that of the silk-worm's thread, almost indeed that of the spider,—for fine as each strand appears to be, upon microscopic examination it is found to consist of upwards of two hundred distinct fibres.

FIRE-PROOF CEILINGS.

Sir,—I have read with much pleasure "a few hints upon the construction of ceilings in dwelling-houses," by Mr. Wm. Vere, in your last number. Although this gentleman appears to have given considerable attention to the subject of his communication, there are some points in which I cannot quite agree with him.

"The spread of accidental fire from room to room," says Mr. Vere, "would be in a great measure retarded by metallic ceilings." Permit me to observe that a good substantial mortar and plaster ceiling, being a very imperfect conductor of hear, offers much more effectual resistance to the progress of fire, than would zinc or even sheet iron, of such a thickness as circumstances would permit to be used for this purpose. Again, the plaster ceiling, if sound, protects the flooring in case of fire above, to a consi-

derable extent, by preventing a supply of air from passing up between the interstices of the boards, (which in some of the modern built houses are wide enough to admit a slice of cheese to feed the young mice) without which, the combustion of wood in a horizontal position proceeds but slowly.

Under any circumstances, the spread of fire from room to room, or even from floor to floor is seldom by means of the ceilings: other more ready and convenient ways of passage being usually presented to the flames, such as doors, flimsy partitions, landings, stairs, &c.

Mr. Dudley, in his excellent practical work "the Tocsin," published about ten years since, recommends the employment of *hoop-iron* instead of laths of wood, for ceilings, partitions and the like. This mode of proceeding, offers a ready and economical method of making these important parts of a dwelling-house or other building perfectly fire-proof; were this precaution generally adopted, in connection with closely fitted substantial floors, and stairs of iron, slate or other incombustible materials, the safety of our buildings as regards the spread of fire and the preservation of human life, would be increased a hundred-fold.

But so long as the vital parts of our buildings continue to be constructed in the most fire inviting manner, the ceilings, which are really at present the most invulnerable portion of the edifice, are not worth thinking about.

Some of the minor inconveniences of the present plaster ceiling, noticed by Mr. Vere, I pass over; merely observing, that I fancy when asked to exchange them for metallic ones, many persons would express themselves content, rather "to bear the ills they have, than fly to others which they know not of."

Your's respectfully,

W. BADDELEY.

London, Dec. 11th, 1837.

FIRE-PROOF METALLIC CEILING.

Sir,—Not wishing to detract from the merits of your correspondent Wm. Vere's suggestion for iron ceilings, I beg leave to forward you a suggestion which I have long thought of, for rendering houses fire-proof, should you think it worthy a place in your valuable *Magazine*. *It is* as follows:—That the floors of houses should be laid in the usual manner, but with the commonest boards, and undressed, except the edges; over which lay a coating of compo about an inch thick, in any colours according to fancy; or it may be painted upon. The ceiling is to have one coat of the commonest plaster, then screw up to that, common sheet iron; the plaster will form a deafening, and also prevent the joists or floor above taking fire, should the sheet iron get red hot from below. The joints of the sheet iron should be covered over with small cast iron mouldings to form the ceiling into pannels; the skirting and architraves in each room to be made of compo; and one side of every door to be covered with sheet iron, and pannelled with beading to fancy. Then should a fire occur in any apartment it could extend no further. It would be always advisable where bed and window hangings are used, to have woollen stuff and not cotton. Any proprietor building houses upon this principle would find it not more expensive than timber; they would let sooner, save the insurance, and above all, the inmates could go to bed with easy minds.

The above suggestion may be applied to houses as they now are, especially where ceilings or floors may want repairing.

I remain, Sir, yours, &c.

A. M'GILLIVRAY.

38, Clarendon-square, Dec. 11, 1837.

LIME AND OYSTER-SHELL MANURE.

Sir,—I should have felt compelled to request the favour of a column for the exposure of Colonel Maceroni's disingenuousness on the lime manure question, were it not fortunately the case that his friend Calx has saved me the trouble by the letter which, as it luckily happens, is printed just opposite to the Colonel's diatribe, and which also happens to supply the omission on which the latter places his sole reliance. Your readers have now "the bane and antidote" both before them in the same number, so that Colonel Maceroni is singularly enough, deprived of the shadow of a triumph even for a single week.

Calx and the Colonel agree on only one subject, that neither ever laid claim to the discovery that oyster-shells would serve for manure: yet that they both

will be evident from their own Calx says (page 24), "there was when *bones*" (the italics are his were thrown away as being of no they are now collected and make nt manure. Would it not be the whole of the bone collectors a small sum for *oyster-shells. I rsuaded that oyster-shells would ood manure.*" On this the Colonel, as his friend Calx observes, in ce apparently in this very matter others—"has on many occasions sted an undue eagerness to claim ay be suggested by others,") writes ws:—"Your correspondent Calx, is a very useful suggestion upon nployment of oyster-shells for e to land. It so happens that *for t fifteen year*, I have been *aware* of *beneficial qualities as manure.*" is this but a claim of priority in liscovery' which had been origi- announced, by Calx?

I remain, Sir,

Very respectfully your's,

H.

ember, 1837.

MANURE—METALLIC CEILINGS —CATTLE DRIVING.

—Your correspondent "Calx" is r. If he will refer to my plainly- statement, he will see that *car-* of lime was recommended by the quoted by the "True Sun;" *lime* only mentioned in abnegation of ity as manure, till it has been two n the soil, and recovered its car- acid and water, from the atmos- If limestone or marble had any names than those I used, *i. e.,* onate of lime," "hydrate carbo- or "carbonated hydrate of lime," ien I would use them to help H. alx to understand that limestone onate of lime, *is not lime*, which *cined* limestone. "Calx" saga- , and with the best intentions to e a lift, says, "Colonel Maceroni the charge (of pounding the mar- carbonate of lime) under the wrong -that of "pounding the hard lime-" instead of that "of burning the one in kilns." If "Calx" will read my letter *in No. 743, he will find e proposition of the writer I alluded* to, regarding the application of pounded *carbonate* of lime or marble, or limestone, or hydrate carbonate to his land *instead* of lime, or *calcined* limestone, could not be expressed in clearer words than there.

But graver matter falls from "Calx." He says, "it must be allowed that Colonel Maceroni, has on many occasions manifested an undue eagerness to claim whatever may happen to be suggested by others." Now, all I say to "Calx" is—Name! Point out one instance of this "eagerness,"—*unsupported by right and proof!*—I say, give me one instance, and I will show you that you are mistaken.

Even the above taunt, unfounded because it is, stimulates me to remark on the sheet metallic ceilings for rooms, suggested in your No. 748, by Mr. W. Vere, and despite of "Calx," inform your readers, that so far back as 1827, I suggested the covering the joists of floors with thin sheet-iron plate, as a preventive against fire, to Mr. Haywood, who was foreman of the works to the builder, Mr. Nurse, then engaged in erecting Chester Terrace, Regent's Park; and he actually did apply it to several, or to *a* ceiling as a preliminary towards ascertaining the expense. I also gave him the drawings to scale of a staircase of cast, combined with sheet iron, which could not take fire, and which he promised to try; as he agreed, that the cost could not be more than that of timber. Just afterwards I sailed for Constantinople, to aid the Mussulmans against the Russians, and I have since lost sight of the parties. Here is another "undue eagerness" for my friend and patron "Calx." But it is no eagerness at all; for I have since, as I had years before 1827, thought the application of thin-sheet *iron* (not zinc) to rafters and boards, as a preservative from fire, as far too obvious to need my pretending to its suggestion, or taking it for any thing like an *invention* at all. But for the iron plate to protect the wood, it must be in *contact* with it, which it will not be, if merely stretched as a smooth ceiling surface, across the rafters. Zinc is out of the question as relates to fire, inasmuch as it fuses at a degree not far above that of lead.

This being Monday, a market day at Smithfield, reminds me of the method

adopted by Italian butchers for taking home the sheep they buy at market. An old ram is kept who goes to market with his master, and all the purchased sheep follow quickly without all the hollowing, howling, whistling, cursing, beating, and dogs, we see throughout the city.

I have the honour, &c.

F. MACERONI.

December 11, 1837.

STEAM FIRE-EXTINGUISHER AND SMOKE PROTECTOR.

Sir,—In your last number (page 157) you have copied an article from the "Glasgow Reformer," descriptive of some experiments recently made by a Mr. Wallace, on the extinction of fire by the application of steam, and also with a smoke protecting dress. It is to be regretted that the account which you have extracted is not so explicit on several points as could be wished, but so far as it goes, Mr. Wallace appears to be entitled to little credit on the score of *originality*.

With respect to the extinguishing powers of steam, I beg to refer your readers back to your 16th vol., at page 379 of which, they will fine a highly interesting detail of some experiments on this subject made by Mr. T. Waterhouse, at Preston in Lancashire, in the year 1832. The result of these experiments proved, that steam speedily extinguishes *flame*, but that a low charring combustion is not prevented; on the contrary, the power of a *coke fire* was greatly increased by the introduction of steam; and that this agent affords a ready means of checking and preventing the rapid spread of fire, but can only be depended upon as an auxiliary to other methods of suppression.

What the peculiarities of Mr. Wallace's smoke-proof dress may be, I know not, but I much doubt its superiority over that now employed by the London firemen, a full description of which has appeared in your pages, (vide. page 352 of your 16th vol.) with a brief sketch of its history. It was originally invented and exhibited in London nine years ago by Mr. Dean; having been subsequently *re-invented in Paris*, it was imported as *a valuable addition* to our fire-extinguishing machinery, and is now constantly employed on all suitable occasions. As the sailor who descended into the ship's hold, stated on his return that "he could have remained *ten minutes longer*," it would appear that the powers of Mr. Wallace's smoke protector are limited. In the smoke proof dress above alluded to, there is no limit to a person's stay in the densest smoke, provided the injection of fresh air be maintained.

Is Mr. Wallace's apparatus a revival of the once celebrated but now obsolete, hood and mouth-piece of the ingenious Roberts?

If some of your Glasgow readers will throw a little more light upon the (at present) dark points of this question, they will greatly oblige

Your obedient servant,

WM. BADDELEY.

London, Dec. 16th, 1837.

MR. UTTING'S ASTRONOMICAL TABLES.—TO A CAMBRIDGE STUDENT.

Sir,—In your remarks on my solution of your question (vol. xxviii, page 107), you assert that your motive for proposing that question, was in consequence of the dispute between a "Scotch Dominie" and myself, "relative to the true method of determining the synodic periods of the planets." I am pretty well aware of your motive in proposing the question, as I anticipated its purport at first sight. You will therefore be pleased to take the purport of the question as an apology for the answer. The earth's period I took at 365¼ days in order to avoid fractions; the process of calculation, is the same, however, as if I had employed my own period.

At page 107, col. 2, you accuse me of putting *the cart before the horse;* now this shows what sort of a *whip* you are, as had you been an accomplished driver you would have been able to have put the horse in his right place. At page 107, col. 2, line 6, for $\frac{P}{n-P}$ (not $\frac{P}{n-p}$ mind) = 487, read $\frac{P}{p-P}$ = 487. Here you could not point out one blunder without committing another!

At page 108, you say, "the only thing I requested was to know the distance a superior planet should be placed from the sun, so that its synodic period with the earth should be performed in n mea[n] solar days," you might have add[ed]

"and determine the limits of the possibility."

After giving your formula for the distance of a superior planet, you say that, "the only limitation in this case is that n must be greater than P." *i. e.*, the period of a superior planet must be greater than that of an inferior one. Why, really Mr. Student, you out-herod the Scotch Dominie! As to your talking about the synodic period of the earth and planet being *infinite*, and also introducing the case of an inferior planet, these are altogether inconsistent with the question. In the case of the synodic period being infinite, their periodic times and mean distances from the sun, must be identical; as you might just as well talk of one half of the earth overtaking the other half, as of two planets at the same distance from the sun, overtaking each other. Neither could a planet be at an infinite distance; as, if it reached the confines of the solar system only, it would cease to obey the laws it was previously governed by, relative to our system, and would leave it altogether. It is extremely probable that no planet or comet in our system can be at a much greater distance from the sun, than in the case given in my answer to your question—viz., about $3\frac{1}{4}$ times the distance of the planet Uranus. Its period of revolution round the sun would, in this case, occupy 488 of our years. So that altogether, I think my solution to your question is quite as consistent as that given by yourself.

You say that, "In one thing, however, Mr. U. has acted wisely, and that is, in not using his own tropical period of the earth; this, at least shows that he must have some misgivings about the accuracy," &c. The following statement, will, I think, show whether or not, you have acted *wisely* in making this assertion, as well as expose your want of candour.

	Tropical year.						
	days.		hours.		minutes.		seconds.
Bessel (N. A. 1837)	365	..	5	..	48	..	47.6
Burkhardt, Bailey, and Herschell	365	..	5	..	48	..	49.7
J. Utting (Tables)	365	..	5	..	48	..	49.8855
Delambre (Astronomie)	365	..	5	..	48	..	50
Burg (Tables)	365	..	5	..	48	..	51.5
La Place (Systeme du Monde, 4th edit.)	365	..	5	..	48	..	51.6

Thus, you see the period I have adopted is nearly a mean of those given by the most celebrated astronomers.

I am, Sir, yours, &c., J. UTTING.

Lynn Regis, Dec. 7, 1837.

SOLUTIONS OF THE QUESTIONS ON HOROLOGY PROPOSED BY HOMO.

Question I.—In the time that the hour hand passes over one hour, the minute hand will pass over twelve hours, or the circumference of the dial plate, their motion being as one to twelve. Now when the hour hand was at nine o'clock, the minute hand was at twelve, whereas, to have been in opposition, it ought to have been at three, or three hours forwarder; whence, $\frac{3 \text{ hours}}{12-1} = \overset{\text{min.}}{16} \,..\, \overset{\text{sec.}}{21\tfrac{9}{11}}$ and as the hour and minute hand were at right angles at nine o'clock, the above time is exactly one fourth of a period of conjunction of the hour and minute hands; hence, the opposition took place at 16 min. $21.\frac{9}{11}$ sec. past nine; and if to this time we add 16 min. $21\frac{9}{11}$ sec. twice in succession, we get the time 9 hours 32 min. $43\frac{7}{11}$, and 9 hours 49 min. $5\frac{5}{11}$ sec. respeetively, for the time of the hands being at right angles, and in conjunction as per question.

Question II.—In respect to this question, I find that the respective hands of the clock form an angle of 120° with each other, as follows:—

	hours.		minutes.		seconds.
Hour and minute hands at	9	..	5	..	$27.\frac{3}{11}$
Hour and second hands at	9	..	5	..	$25.\frac{325}{719}$
Minute and second hands at	9	..	5	..	$25.\frac{25}{59}$

Hence it is evident from the variation in the above times, that no trisection will in this case take place. The nearest approach is when the complement of the

angle formed by the hour and minute hands to 360 degrees is bisected by the seconds hand, which will be at 9 hours 5 min. 25 4379818sec., when the angular distance between the respective hands will be. as follows :—

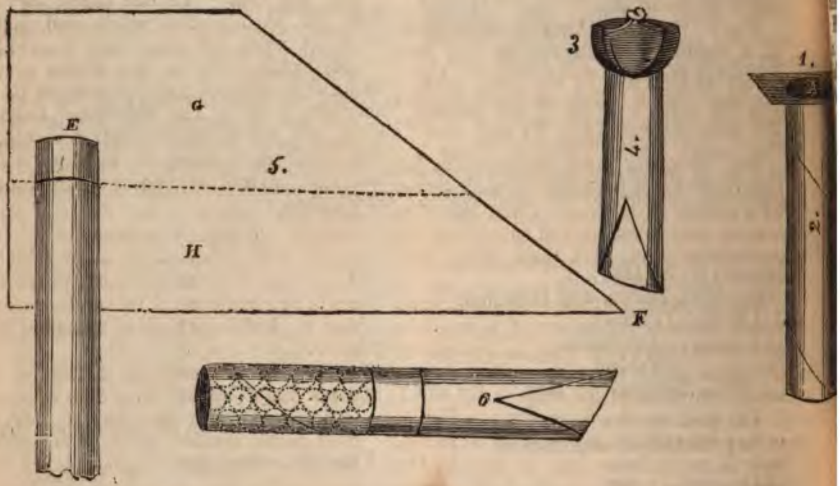
Hour and minute	119°. . 49'. . 94".534
Hour and second	120 . . 5 . . 2 .733
Minute and second	120 . . 5 . . 2 .733

Hence a *trisection* is impossible, as this is the *nearest approximation* which will take place in all the various positions of the hands on the dial-plate during the twelve hours, or in one revolution of the hour hand; after which the various positions of the hands are repeated.

J. UTTING.

Lynn Regis, Dec. 8, 1837.

COLONEL MACERONI'S RIFLE BALL AND BUCK SHOT CARTRIDGE—METHOD OF PRESERVING LOADED FIRE ARMS, ECT.



Sir,—I am glad to learn from various notices in the papers that the national and useful amusement of rifle shooting, is becoming more attended to in this country. Without entering on the political merits of the subject, which are of great magnitude in a general point of view, I will confine myself to the communication of some details which experience tells me should be attended to by rifle shooters, and which I abstract from a paper presented by me to the Horse Guards in 1826.

It cannot be denied that the efficiency of light troops, or of an armed people in skirmishing, mainly depends on the effect of each individual shot. It has been sufficiently demonstrated, that a smooth barrel, such as the common musket, and as it is generally used, will not propel a *bullet with any* degree of accuracy, even the short distance of sixty or seventy yards.

The only objection to the use of the rifle as hitherto managed, and which has been deemed sufficient to exclude its use from the French armies during the whole of the late war, is the inconvenience and loss of time experienced in loading it, the powder and ball having to be introduced separately, and it being indispensable that the latter should be enveloped in a piece of greased tissue, to facilitate its descent into the barrel, with sufficient constriction to force its substance into the spiral grooves from which it receives its rotation.

Many methods of combining paper with linen or cotton, suggested themselves in my experiments. The powder must be in paper, so that it may be torn by the teeth; and the ball must have no paper

over it, but only a greased tissue of cotton or wool. Without stopping to describe the defective plans, I will proceed to describe one, by which a rifle may be loaded with, at least, the same precision and efficacy, as by the present inconvenient practice, and, at the same time with very nearly the same degree of case and rapidity as a common musket and cartridge.

Fig. 1. is a bit of cotton, two diameters of the bullet square. Such pieces can be made very expeditiously by merely tearing long slips and then cutting them into squares, when placed ten or more, one over the other.

Fig. 2. represents the paper case made on a mandril, which has its end well hollowed out or "contresunk." Upon the paper being rolled, turned down and touched with glue, the cavity A, is perfected by pressure upon a bullet.

Fig. 3. is the bullet enveloped in the square of calico, secured at the corners by a couple of stiches. I find that it is best to glue the square of calico into the paper case first, and then, when dry, stitch the bullet into it.

Fig. 4. is the cartridge complete, upon which it must, by means of a brush or any other convenient way, be greased by the application of melted tallow to the cotton envelope of the ball.

The folding-up represented in Fig. 4, is far preferable to any ligature of string, as it is much more easy to tear by the teeth, and a gentle twist of the hand, without any jerk or casual loss of powder. It is superfluous to point out that the resistance of the atmosphere to the open ears of the cotton envelope, detaches it from the bullet the instant of its exit from the barrel.

Let rifle shooters try this cartridge, and also all those who would make ball cartridges for their fowling pieces, or well made fire arms, especially pocket pistols. They will be found to go down far more easily than those made all of paper. In fact, if a ball be tolerably true in its sphereosity and enveloped in a greased rag, a well bored smooth barrelled gun, will then propel its bullet even two hundred yards, with almost as much accuracy as a rifle, until it becomes foul, and then the same ball will no longer fit, or go down, and a smaller one will allow too much windage after *getting out of the lower part of* the barrel.

It must have been observed by most persons who have ever kept loaded fire-arms in their houses, that after a short time, the are very apt to miss fire; now with the prepared hermetical copper caps, which I have previously described in your excellent periodical, and a greased cork wad over the powder, a piece might be kept in a cellar or a well of water for a twelve-month, and go off as if only freshly loaded. But there is an action going on by the contact between the gunpowder and the iron, especially in the small channel of the nipple, by which both the one and the other are decomposed, and the former will not ignite, however clean and dry the gun or pistol may have been when loaded. Now, I find that to prevent the least tendency of the iron to rust and decompose the powder, when arms are to be kept loaded for a length of time, the barrel must be warmed to a point which the hand can just endure, then pour into it a few drops of spirit varnish so that it comes out of the nipple. This dries up in a few minutes. A very good varnish for this purpose is made by dissolving a bit of shoemakers wax in double its bulk of spirits of turpentine.

To make the cases of cartridges, the paper must be cut into the trapezoid shape, fig. 5; but the mandril must be used in the inverse sense to that represented in the figure, which shews how the wooden wad or bottom is placed in the middle of the paper case for the making of buckshot cartridges. I will not occupy your space by directing how simple ball cartridges ought to be made, because, for private use, the rifle cartridge is far preferable for any kind of fire arm, as it has less windage, and goes down much easier than one of mere paper, that fits the piece.

For the defence of ones house or person, buckshot cartridges are preferable to single ball, provided that they are used so as to obtain the entire effect of the powder. If you fire a charge of buckshot against a plank, with nothing but brown paper, or a pastboard wad between them and the powder, you will find that they will not have one third of the penetrating power which will be given them by the same charge of powder, but with a wad of wood, leather, or cork half an inch thick, upon the powder.

That wad upon the shot is best which makes the least resistence; all required there, is preventing its moving or falling out, for which purpose, nothing is better than stiff brown paper. But when cartridges are used, they are of themselves complete.

According tó the regulations of the French army, buckshot are directed to be served out to the troops in the defence of a redoubt, a breach, &c. &c., but as they are given in a loose state, little advantage is obtained from them. It would be very easy to make cartridges combined of ball and buckshot, if it were expedient to place the ball between the powder and the shot. But in this case I have found that the ball passing through the shot, disperses them almost at right angles, so that not one has hit a door at fifty yards. A good and easy way to make buckshot cartridges is exhibited in fig. 5. A bit of wood E, slightly less than the bore of the piece, is placed at the end of the mandril, and being touched with paste, glue, or gumwater, is rolled up in the paper trapezoid fig. 5. in which it constitutes a solid diaphragm. The point of the paper at F, being touched with paste or glue, a case is formed, into the lower and stronger half of which, H, is placed the buckshot, and in the other, G, the powder. The buckshot must be selected of such a size as will allow of their lying evenly by threes or fours, and so they must be dropped in, to the number intended (twelve to eighteen.) The cavity in the centre of the buckshot, I fill up with No. 1, birdshot or "big Bristol." The most easy and expeditious way of closing the paper over the shot is with sealing wax. The powder end is best closed by the folding represented figures 4 and 6.

But the very best buckshot cartridges are made, by placing the powder and and shot in separate cases, and then sealing them to each end of a cylinder of cork half an inch long, and of a diameter to fit the piece exactly, as represented in fig. 6.

Respecting cork wads, I would recommend your sporting readers to try them; and sure am I they will approve of them. Corks can he had almost any where, and when too large for the gun, a rasp (not a knife) will speedily reduce them to the proper size. Then grease them well, and *cut them in pieces one* third of an inch thick. Being larger than the bore, prevents any escape of power, so that the shot are forced like unto a ball, until the exit from the barrel. A cork cutter will furnish you with a hundred cylindrical soft corks, rather larger than the bore of your gun, which will give you at least four hundred wads, the best that possibly can be used. Over the shot a bit of brown paper must be placed, to keep them in their place. The best size of buckshot for a gun, is that of 120 to the pound, for a pistol, 240.

I perceive in your last number 747, that a Mr. Hawthorn has taken out a patent for a railway scraper, or "protector" as he calls it. Now, Sir, if you were to refer your readers to the plan I proposed in your Magazine, vol. xvi, page 186, I venture to say that they would give my "invention" the preference over Mr. Hawthorn's patent.

My spring actually presses on the rail and must scrape it perfectly clean, but it is so formed as to jump over any dislocation between the parts of the rail. Moreover, depend upon it, that one day the railway gentleman will be glad to use my brush that follows the S scraper, and the rosin dredging box on the inclines.

I have the honour to be,
Sir,
Your obedient humble,
F. MACERONI.

HOROLOGICAL QUESTION, BY A TOWN TEACHER.

It is now twenty minutes past six o'clock; what time must elapse when the arch intercepted between the hour and minute, will be bisected by the second hand?

CHEESE FROM POTATOES.

Cheese, it is said, of extremely fine quality, is made from potatoes, in Thuringia and part of Saxony, in the following manner:—After having collected a quantity of potatoes of good quality, giving the preference to the large white kind, they are boiled in a cauldron, and after becoming cool, they are peeled and reduced to a pulp either by means of a grate or mortar. To five pounds of this pulp, which ought to be as equal as possible, is added a pound of sour milk, and the necessary quantity of salt. The whole is kneaded together, and the mixture covered up and allowed to lie for three or four

according to the season. At the end of this time it is kneaded a-new, and the cheeses are placed in little baskets, when the superfluous moisture is allowed to escape; they are then allowed to dry in the shade, and placed in layers in large pots or vessels, where they must remain fifteen days. The older these cheese are the more their quality improves. Three kinds of them are made. The first, which is the most common, is made according to the proportions above indicated; the second with four parts of potatoes, and two parts of cow or ewe milk. These cheeses have this advantage over every other kind, that they do not engender worms, and keep fresh for a great number of years, provided they are placed in a dry situation, and in well-closed vessels.

PROBABLE EFFECTS OF THE RAILWAY SYSTEM.

It might be a curious speculation to inquire into the probable effects of the railroad system on mankind. Certainly no system ever became so popular, and so suddenly and so widely popular. France has begun to fling out those gigantic arms of communication over her noble country. Belgium exults in the commencement of a web of railroads, in which it expects to catch all the stray dollars and centimes of the Continent. The transit from Ostend to the Rhine will, in the course of a year or two, be an affair of a couple of hours. Germany is shaking off her sleep, her black-smiths are lightning their Hercynian forges, and from the mountains of the Hartz to the Tyrol, huge men, with antediluvian visages and Cyclopean arms are hammering at iron wedges, rails, and gear, for "fire horses." Prussia is laying down railroads from her capital to France, to Poland, and to Austria. The puzzling question of her politicians being, whether she thus invites invasion, or proposes defence. * * * *

But, thanks to the growing common-sense of mankind, they never will be able to do even this again, and that the world are beginning to discover that fifty years of victory are not worth one year of peace. In short, the world has evidently become a buying and selling world, a vast spinning and weaving community, a vast aggregate of hands and heads, busy about the main chance, and much more inclined to eat, drink, and be happy, than to burn each other's warehouses, or blow out each other's brains. That war will never cease out of the world, is a theorem founded on the fact that the countless majority of mankind have a strong tendency to be fools; but we may establish another theorem, that the more difficult it is to make war, the less likely it is to be made. The more mechanical dexterity, personal ingenuity, and natural expense that is required to make war, the more will success be out of the power of brute force, and the more in the power of intellectual superiority. Let war come to a conflict of steam-engines, and all the barbarian rabble of the world, Turks and Tartars, Arabs, Indians, Africans and Chinese, must obviously be out of the question at once. They may massacre each other, but they must fly from the master of mechanics. All the half-barbarians, Russian, Greek, Pole, Swede, and Austrian, must make the attempt only to be shattered, and Field-Marshal Stephenson, with his squadron of fire-horses, galloping at the rate of eighty miles an hour, must consume their battalia with the breath of his nostrils. Thus England, instead of feeling alarmed at the sudden passion of foreigners for mechanism, should rejoice to see the passion spreading, should encourage them to throw all their powers into mechanical rivalry, and exult in every railroad that shoots its serpent line among the hills and valleys of the Continent, and hail the smoke of every steam-engine that trails its murky line along its sky, as not merely an emblem, but an instrument of their own superiority. Mechanism, the great power of art, is as exhaustless as any of the great powers of Nature, for it is only the exhaustless vigour of intellect combining with, and commanding the secrets of Nature. Ten thousand years might roll on, and every year see a new advance of every kingdom of Europe in invention, and England keeping a head of them all, and, like one of her own engines, showing her speed by the sparks that lighten the road behind. The steam-engine, in its effective state, is but little more than half a century old, for its invention, in the time of Charles II., left it for upwards of half a century, little more than a toy. In half a century more, its present perfection may be looked upon as little else than that of an ingenious plaything. It is scarcely ten years since the steam-boat first ventured to sea. Thirty years ago, the late Lord Stanhope was laughed at by all London for his attempt to swim the steam-boat from London Bridge to Greenwich. It now dashes from the Tower to Gibraltar, and from Gibraltar to Constantinople; or shoots down the Red Sea, fights the monsoon on its own ground; sweeps to Bombay, Ceylon, and Bengal, and astonishes the Mogul and the Emperor of China, the same morning, with the last month's newspapers from London. The railway, in its present power, is not ten years old, yet is already spreading, not merely over Europe, but over the vast

savannahs of the New World. What will all this come to in the next fifty years? What must be the effects of this gigantic strider over the ways of this world! What the mighty influence of that mutual communication which, even in its feeblest state, has been in every age the grand instrument of civilization! Throw down the smallest barrier between two nations, and from that hour both become more civilized. Open the close shut coast of China or Japan to mankind, and from that hour the condition of the people will be in progress of improvement. The barbarian and the despot hate the stranger. Yet, for the fullest civilization, freedom, and enjoyment, of which earth is capable, the one thing needful is the fullest intercourse of nation with nation, and of man with man. The European passion for the railroad is certainly one of the most singular, as it is one of the most cheering characteristics of the age. Like all the instruments of national power, it may be made an instrument of national evil. It may give additional strength to the tyrannical, and accumulate force against the weak, pour resistless invasion against the unprepared, and smite the helpless with unexampled rapidity of ruin. But its faculties are made for peace, its tendency is to make nations feel the value of peace; and unless some other magnificent invention shall come to supersede its use, and obliterate the memory of its services, we can not suffer ourselves to doubt that the whole system, which is now in the course of adoption with such ardour throughout Europe, will yet be acknowledged as having given the mightiest propulsion to the general improvement of mankind.—*Blackwood's Magazine.*

ANNUAL METEORIC SHOWERS OF NOVEMBER.

(From a New York *Paper.*)

The fact of an occurrence of an extraordinary exhibition of meteors, or shooting stars, on the morning of the 13th of November, every year for six years past, afforded a sufficient reason, independently of every theoretical consideration, for watching the heavens attentively on the night of the recent anniversary. The result has justified our anticipations; and we are able to say, that the annual meteoric shower of November has been repeated the present year. The scale, indeed, was vastly inferior to those of some other years, but still the phenomenon was marked by such distinctive peculiarities with respect to the number, origin, direction, and trains of the meteors, as to leave no doubt of its identity with them.

In order that every part of the firmament might receive its due share of attention, the four quarters of the heavens were parcelled out amongst eight persons, two to each quarter, one to observe, and one to record.

The early part of the evening of the 12th afforded some signals of promise. A copious rain which fell on the previous night, attended by an easterly wind, had given place to a serene sky, with the wind at the west; from the setting sun diverged large colums of a peculiar rose-coloured vapour; and before six o'clock, an auroral pillar, of a crimson hue, presented itself in the northwest; but before seven o'clock every unusual appearance had vanished, and left an unclouded sky.

The full moon, however, shone with so strong a light as almost to hide the stars, permitting none to be seen below the third magnitude: of course no meteors but those of unusual brightness could be visible.

No shooting stars were observed until five minutes past one o'clock, when they began to appear at considerable intervals, emanating as usual from the head of Leo, which constellation was then ascending the eastern sky. The meteors gradually increased in number and brightness until daylight. Nearly all, as they darted forth, left visible traces of their paths. Some of these were brilliant, and all must have had a high degree of brightness to have overcome so strong a moonlight. Indeed, in such a state of the sky, it is rare on common evenings to see shooting stars at all. These traces were in most cases to be regarded not as trains arising from the deposit of luminous matter, but as mere lines of light, owing to the velocity of the meteors, which was so great that a continued impression was left on the eye, like that of a stick ignited at the end and whirled in the air. Trains remaining after the extinction of the meteors (which made a conspicuous figure in the meteoric shower of 1833) are rarely luminous enough to be visible in full moon light. Only two were observed on the present occasion.

The whole number counted during the night was 226. Of these, all but ten or twelve either radiated from a point in the head of Leo, or moved in lines which, if continued, would have passed through that point. The position of the radiant was at first near the Lion's eye (at the star Mu Leonis,) but afterwards moved southward and eastward a little, and soon after three o'clock became stationary, near Epsilon Leonis (right ascension 146 deg., declination 24 deg. 30 min.), within half a degree of its position in 1836.

The *maximum*, or period of greatest frequency, has usually occurred about four o'clock; but on the present occasion after three o'clock the numbers rapidly increased

and remained nearly uniform for the next three hours, averaging nearly one per minute.

The various meteorological instruments were attentively inspected during the night, but nothing remarkable was observed.

Yale College, Nov. 14. O.

In noticing the shower which occurred on the 13th of November a year ago, in connexion with others which had occurred on the same night of the year for five years previous in succession, Professor O. stated the following as among the characteristics of the phenomenon :—

"1. The number of meteors, though exceedingly variable, is much greater than usual, especially of the larger and brighter kinds.

"2. An uncommonly large proportion leave luminous trains.

"3. The meteors, with few exceptions, all appear to proceed from a common centre, the position of which has been in nearly the same point in the heavens—viz., in some part of the constellation Leo.

"4. The principal exhibition has at all times and at all places occurred between midnight and sunrise, and the *maximum* from three to four o'clock.

"In all these particulars the meteoric showers of 1834, 5, and 6, have resembled that of 1833; while no person, so far as I have heard, has observed the same combination of circumstances on any other occasion within the same period."

More evidence concerning these appearances has been lately transmitted to the French Academy of Sciences : the last communication bears the intelligence, that in an entirely new quarter, the Mauritius, M. L. Roberte observed the same meteoric shower of fallen stars on the night between the 12th and 13th of November, 1832, being at the same period in all respects similar to that on the same night seen in all parts of Europe, and which is a full confirmation of the recently broached idea of the periodical fall of showers of stars on or about the 12th or 13th of November. Pursuant to this information astronomers have anxiously awaited the return of these days, or rather nights, and on Sunday evening their labours were rewarded, and the previous supposition in a great measure corroborated, by the appearance of the beautiful phenomena which we are about to describe. About six o'clock on the evening of Sunday, a luminous arch was observed to extend over the western portion of the heavens, and after passing through various gradations, in point of colour and size, disappeared.

It soon after re-appeared, and was immediately recognized as a magnificent specimen of the aurora borealis, which has lately been more than ordinarily frequent in the southern regions.

The colour, that of a bright crimson, presented a striking but not unpleasing contrast to the softer light of the Moon, which was at that time shining in its brightest effulgence. Nothing could be more gorgeous than the scene which the heavens then presented; a clear blue sky, without a cloud, save those which bore the appearance of being spun from the finest gossamer, met the view of the spectator on the east; and in the opposite quarter of the firmament streaks of the brightest crimson threw uncertain and flickering rays over the landscape, impressing the beholder with the utmost awe and admiration. About eight o'clock, the attention of those who were observing the aurora was diverted to the singular and unusual phenomenon of a bright meteor, apparently proceeding from the north, which, after making a rapid descent, in the manner of a rocket, suddenly burst, and scattering its luminous particles into the most beautiful forms, vanished into the atmosphere, from which it seemed to arise.

This was succeeded by others all similar to the first in both the shape and manner of its ultimate disappearance. The whole display terminated at ten o'clock, when dark clouds, which continued up to a late hour, overspread the earth, preventing any further observation. Astronomers are much at variance as to the manner in which these meteorological phenomena are produced; and although the principle of spontaneous combustion is now established beyond the power of contradiction, the recurrence of these celestial prodigies is well worth the attention of those who make such inquiries their study.—*Times*.

We translate the following observations by M. Arago, on shooting stars, from the *Annuaire*, annually published by the French Board of Longitude.—"These phenomena, which have often been considered unworthy of investigation, and regarded simply as atmospheric meteors originating in the inflammation of a quantity of hydrogen gas, have, in consequence of recent observation, become objects of greater attention among men of science; but from observations made at Breslau, and other places, by Professor Braides and several of his pupils, the height of some shooting stars has been calculated at 500 English miles, and the rate at which they move not less than thirty-six miles in a second, which is nearly double the rate of the earth's motion round the sun. It is singular that their general direction should be contrary to that in which the earth moves in its annual orbit, and it is much to be desired that the inferences already deducted

should be corrected or confirmed by a greater number of observations. The shooting stars of America, to which allusion has been made, were observed in 1833. They succeeded each other at such short intervals that it was impossible to count them; and the most moderate calculations fixed their number at hundreds of thousands. The phenomenon was visible along the whole of the eastern coast of North America, from the Gulf of Mexico to Halifax, from nine o'clock in the evening to sunrise, and in some places in full daylight at eight o'clock in the morning. All these meteors came from the same point of the Heavens, namely, that of Leo, and those which were seen elsewhere was the effect of the earth's movement, which caused an apparent alteration in the position of this star. The above facts are certainly very curious, but the following are not less so. The shooting stars observed in the United States appeared in the nights of the 12th and 13th of November. In 1791 a similar phenomenon was observed in America by M. de Humboldt, in Greenland by the Moravian Brethren, and in Germany by various individuals; and the period of its appearance was also the nights of the 12th and 13th of November. In 1832, in Europe and some parts of Asia the phenomenon was witnessed, and the date was still the nights of the 12th and 13th of November. The facts we have given confirm more and more the existence of a zone composed of myriads of small bodies, whose orbits come within the limits of the earth's ecliptic every year between the 10th and 13th of November. This is a new panetary world which begins to open us. It is almost unnecessary to state how highly important it is to ascertain if other masses of asteroids do not come within the earth's ecliptic at oither points than that which it reaches about the 12th of November. It is desirable to make observations between the 20th and 24th of April as well as in November; for in 1803, on the 22d of April, I believe from one o'clock in the morning until three, shooting stars were seen in all directions in such numbers, in Virginia and Massachusetts, as to be compared to a shower of sky rockets.

NEW SAND FOR GLASS-MAKERS.

Some very curious experiments have been lately made on a new species of sand brought from Australia, for the manufacture of the finer kinds of flint glass. Of all the results of manufacture, glass is at once the most extraordinary and the most beautiful, and the most difficult to urge beyond a certain point. There is none in which science of *the highest kind* is so strongly interested, *and therefore none* which ought to be more patronized by the government of the greatest scientific and mechanical and manufacturing people in the world. * * * *

As to the sand in question, six years ago it was observed that in many places between Sydney and Botany Bay, the surface of the ground was covered by a remarkably pure and white silicious sand, derived from the decomposition of one of the beds of sand belonging to the coal formation. Mr. King of Sydney the discoverer, being of opinion that this sand would be found peculiarly applicable to the business of glass-makers, forwarded eleven bags of the same to his agents in London. Some was put into the hands of Messrs. Pellatt and Co., of the Falcon Glass-house, for trial. From their report the following is an extract :—

" We find the sand from Sydney to be decidedly superior to any we have previously employed. The most esteemed property of this sand, and that which makes it of the greatest importance to glass-makers, is derived from the absence of oxide of iron, and every other combination that would affect the colour of glass. It is also free from insoluble matter. Glass made from this sand is more brilliant and watery than any other. We consider it fortunate, as the sand with which most glass-makers were supplied, is now of very bad quality, and has been given up by many." On application to Mr. Pellatt, the following further particulars were obtained. He says that the recent arrival of a few hundred weight of this superior silex had enabled him to make a second experiment, which turned out fully as well as the first. He is of opinion that the Sydney sand exceeds all others heretofore in use for whiteness, brilliancy, and fusibility; and he has little doubt, should the freight be moderate, that this comparatively pure material will be imported in large quantities for glass-makers' use in this country. He had mixed it with the usual proportions of carbonate of potash, and nitrate of potash, with a rather less proportion of manganese than other sands require. He hopes soon to be able to report on the Sydney sand as regards flint-glass-ware for optic plate. A few tons of the same kind were lately imported into Liverpool, and were eagerly purchased, so that a considerable improvement in the qualities of the finer kinds of glass may soon be expected.—*Blackwood's Magazine.*

NEW SAFETY COACH.

The multitude of arms and legs broken from the overturning of stage-coaches is fearful. They make a formidable figure in that chapter of accidents which the public are permitted to see, but are probably many more than ever reach the public eye. To

render a stage-coach incapable of overturning would be a discovery of more use to the nation than the philosopher's stone. A coach which seems to have nearly attained this point has just made its first experiment. It started a few days since from Blackfriars to Blackheath, and back again, for the purpose of trying experiments as to its security in passing over elevated ridges in the road, and its capacity in keeping an equilibrium when the wheels on one side of the carriage are on an elevation of two feet, or two feet and a-half above those on the other side. The principle on which the safety of the coach relies, is that of the whole weight being suspended on elliptic springs, placed considerably above the centre of gravitation. The result of this contrivance is, that the body of the coach remains always perpendicular, being, as it were, suspended from the springs, as in the cabin of a ship a hammock is suspended from the ceiling, so that whatever is the rolling of the vessel, the hammock retains its perpendicular position. The invention, which is very ingenious, effects the end of the patentee by two upright supporters rising from the beds and axles, and passing up between the body and the boots. The tops of these supporters are surmounted by elliptic springs, to which is affixed one-half of the shifting centre of gravity, the other half is attached to the body of the coach. The external appearance of the coach is very light and elegant; no springs whatever are visible outside. The axles and transoms are the same as in other coaches; the perch is different in its construction from the common perch; it is straight in the middle, but is in fact a double perch, and it is composed of two pieces, and branches out at each end. When inside, by turning down the lining at the back and front, the elliptic springs become visible, aud the mechanism of the contrivance is at once explained. The coach proceeded at the rate of twelve or fourteen miles an hour, drawn by four horses. During its course towards Blackheath, to prove the efficiency of its construction, the coach was purposely raised, so as to keep the wheels on one side on a bank eighteen inches higher than the road, and at that time it had fourteen persons outside, four inside, and nearly half a ton of luggage on the roof. On arriving at Blackheath, the insides and outsides alighted for a few minutes, but almost immediately eight persons ascended the outside, and two got within. The coach was then driven up a bank two feet seven inches high, and turned sharply round, and then at an almost reckless speed over ridges, gaps, and inequalities of all sorts. It surmounted every difficulty, and excited the astonishment and admiration *of numerous spectators.—Ibid.*

AMERICAN PRINTING BY MACHINERY.

The improvement of the printing press is, in value, not far short of printing itself. It is curious to find that the art of making paper from linen rags almost immediately followed the original discovery of printing with movable types. If parchment had continued to be the only material, the use of the press must have been almost wholly precluded. Paper of straw, of cotton, and of papyrus had been tried, and failed from its dearness, its difficulty, and its speedy wear. The linen rag was accidentally and fortunately used, and we thus obtained the true material to receive the thoughts of mankind, and transmit them almost imperishably.

The steam-press works with a force, a rapidity, an exactness, and an ease which make a new era in printing. But a press, just announced as the work of an American artist, leaves even the steam-press far behind. It is said to be able to work off *fifty* reams of the largest sized paper in the day. Attached to a paper-mill, it will work off its impression as fast as the mill can manufacture the paper. A sheet of paper, twenty-six feet long, has been printed by this press in fifteen seconds. This sheet was equivalent to two volumes of 180 pages each. The price of the machine is moderate—1000 dollars. Its chief work hitherto has been with stereotype plates, and for those it has been peculiarly adapted.

We admit that this is an American account, and we perfectly know that Jonathan delights in amplification. But he is still an ingenious mechanic; some of the cleverest additions to the printing apparatus, of late years, have been of his invention. Mechanismn is boundless, and we have no right to be sceptical at any point short of impossibility.—*Ibid.*

NOTES AND NOTICES.

British Museum.—The number of persons admitted to view the general collections of the British Museum during the last six years is as follows:—99,912 in 1881; 147,896 in 1832; 210,495 in 1833; 237,366 in 1834; 289,104 in 1835; 383,157 in 1836.—The number of visits made to the reading-room, for the purpose of study or research, was about 1,953 in 1810; 4,300 in 1815; 8,820 in 1820; 22,800 in 1825; 31,200 in 1830; 38,200 in 1831; 46,800 in 1832; 58,800 in 1833; 70,266 in 1834; 63,466 in 1835; 62,360 in 1836.—The number of visits by artists and students to the galleries of sculpturo for the purpose of study was 4,938 in 1831; 4,740 in 1832; 4,490 in 1833; 5,645 in 1834; 6,081 in 1835; 7,052 in 1836.—The number of visits made to the print-room was about 4,400 in 1832; 2,900 in 1833; 2,204 in 1834; 1,065 in 1835; 2,916 in 1836.—In 1836 the trustees expended the following sums:—For Egyptian antiquities, including sarcophagus of the Queen of Amasis, 855*l.* 5*s.* 10*d.*; for antique vases 3,478*l* 18*s.* 7*d.*; for etchings by the Dutch masters, 5,000*l.*; for a MS. Bible said to have belonged to Charlemagne, 750*l.*—The whole cost of this noble institution for the year 1836, including the main-

tenance of the establishment, salaries of officers, and the sums expended as above stated, was 23,291*l.* 7*s.* 5*d.*—*Statistical Journal.*

The Sounding Mountain.—The following is an extract from a letter from Lieut. Welstead, dated Mount Sinai, September 26, 1836, and published in the Journal of the Asiatic Society, Bengal.—"You once expressed a wish to know something of the *Djibbel Narcono* or sounding mountain, concerning which there has been so much doubt ahd discussion in Europe. I visited it on my way here—it is situated on the seashore about eight miles from Tor. A solid slope of the finest drifts and extends on the sea face from the base to the summit (about six hundred feet) at an angle of about 40 degrees with the horizon. This is encircled or rather simicircled, if the term is allowable, by a ridge of sandstone rocks rising up in the pointed pinnacle, and presenting little surface adapted for forming an echo. It is remarkable that there are several other slopes similar to this, but the sounding or rumbling, as it has been called, is confined to this alone. We dismounted from our camels, and remained at the base while a Bedouin scrambled up. We did not hear the sound until he had attained a considerable height. The sound then began rolling down, and it commenced in a strain resembling the first faint notes of an Eolian harp, or the fingers wetted and drawn over glass—increasing in loudness as the sand reached the base, when it was almost equal to thunder. It caused the rock on which we were seated to vibrate, and our frightened camels, animals you know not easily alarmed) to start off. I was perfectly astounded, as was Captain M——— and the rest of the party. I had visited it before in the winter month, but the sound was then so faint as to be barely evident, but now the scorching heat of the sun had dried the sand and permitted it to roll down in large quantities. I cannot now form the most remote conjecture as to the cause of it. We must not I find now refer it to the sand falling into a hollow; that might produce a sound, but could never cause the prolonged *vibrations*, as it were, of some huge harp string. I shall not venture on any speculation, but having carefully noted the facts, I shall lay them, on my arrival in England, before some wiser head than my own, and see if he can make anything out of them."

Prussic Acid in the Human Body—Among the startling facts which science has disclosed to us, is one so extraordinary, that we should feel it a duty to doubt it, notwithstanding the highest testimonies of its truth, if actual experiment did not prove it,—that the proximate principles of the poison of prussic acid are actually present in our bodies, and may, under some circumstances be developed. This very poison, a small quantity of which, pure and concentrated, killed Professor Scharinger at Vienna,when diffused upon his naked arm, may be said to exist within us, and circulate in our frames. It can not only be obtained from us with the greatest facility after death, but is formed in certain diseases ot the fluids of the body. The blue stain which is imparted to linen from blood in a state of decomposition, owes its colour to this deadly poison. Of the circumstances under which it may be developed, when the elements that form it exist, we have much to learn; we know that a series of changes are constantly occurring in all the objects of nature, that at evary instant of time, every particle of matter is entering into new combinations, and that sometimes, from the most innocent materials, spring forth the most noxious poisons.—*Dr. Sigmond's Lectures in the Lancet.*

Incombustible Paint.—An exhibition of the singular properties of a new species of paint (the ingredients in which are as yet kept secret) took place lately at White Conduit House Gardens, where the parties interested in its preparation (Messrs. De Witte, Levingstone, and Davies) had made arrangements for showing, on a limited scale, its powers of preventing the spread of flames to timbers coated with it. Two close wooden buildings, of the size and shape of sentry boxes, were placed in the grounds. One of them was coated on the inside to the thickness of about the eighth of an inch with the composition. It was also partially covered on the outside, and the other was merely the plain wood. A flooring was placed at about the centre of each of these, and through the holes in front, shavings were put, and then ignited. That which was not coated with the composition was soon in flames, while the fire in the other went out without having had any effect upon the general structure. The building which was in flames was then placed contiguous to the partially coated outside of the other, and although it was not materially injured, the exterior coating peeled off in some places, and the wood became charred. The interior, however, appeared perfectly uninjured by the flame, The proprietors stated that the inside had not been properly prepared, and that it had only that morning been covered with a thin coat of the composition, and that it was necessary that it should be in a dry state to prove its efficacy. Before a decided opinion can be given that the use of this composition will, to use the language of its inventors, when laid on the timbers of houses and ships, render conflagration impossible, the experiments must be tried on a much more extensive scale. Several scientific gentlemen were present, who appeared highly satisfied with the experiment.

Timber required for a Ship of the Line.—A regular seventy-four gun ship requires 3000 oaks to build her. These trees would cover 100 acres of land for their growth, and would be nearly 100 years coming to perfection. 3000 oaks would timber 1000 cottages, for as many industrious families, who add to the national wealth.

New Conduit under the Thames.—Sir,—I observe that you have inserted in your useful publication of Saturday last, a notice of the *new Conduit under the Thames*, from the Reservoirs of the West Middlesex Water Company at Barnes, in Surrey, to their Engines at Hammersmith, in Middlesex. I beg to state that Mr. Hoof is not "the Architect" of the West Middlesex Water Company: nor is he entitled to the merit of having "projected" this important addition to their Works; though I believe it to be true that Mr. Hoof, and some of his family, have passed under the Thames, through the Conduit, which he, as *Contractor*, has nearly completed under the direction of Mr. W. Tierney Clark, the Company's Engineer. M. K. Knight, Sec.

Office of West Middlesex Water Works,
New Road, St. Marylebone, 14 Dec. 1837.

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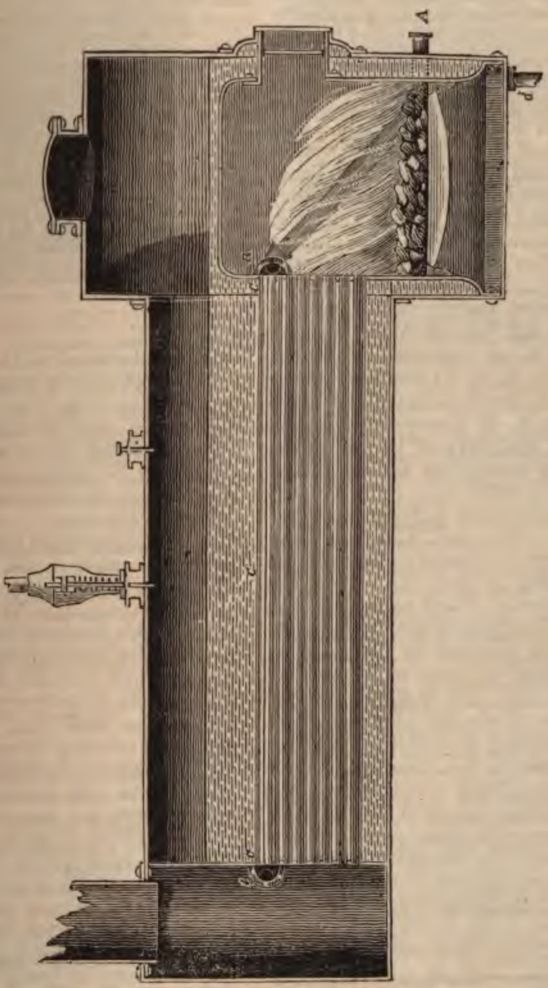


BELL'S PATENT IMPROVEMENT IN STEAM BOILERS.

BELL'S PATENT IMPROVEMENT IN GENERATING STEAM.

Mr. William Bell, of Edinburgh, lately obtained a patent for improvements in heating and evaporating fluids, from which very important results are anticipated. The invention consists in the application of heated air in the manner shown in the following description:—

Description of theDrawings.—Figure 1 (front page) is a longitudinal section, and fig. 2, a transverse section of a steam boiler having the improvements applied thereto, in each of which figures, the same letters indicate similar parts. The boiler is similar in construction to those boilers now used for locomotive engines. The construction of steam boilers and vessels for heating and evaporating fluids, being well understood, it will only be necessary to point out the various parts in which Mr. Bell's invention consists. A, A, are two pipes or tubes which pass through the furnace, and are in contact with the fire therein; hence, any air forced through such pipes will become highly heated; the pipes A, A, are connected by a trunk, B, with tubes, C, C, C; hence, as atmospheric air is forced through the tubes or pipes, A, A, it passes through the pipes, C, C, and gives off its heat to the surrounding water, and having passed off from the boiler, may be conducted away to answer other purposes hereafter mentioned. The pipes, A, A, are to be connected to a blowing apparatus such as an air pump or rotary fan. From the above description, it will be evident that in place of having the pipes, A, A, in addition to the fire bars of the furnace; the fire bars or some of them may be made hollow, and thus suitable for the passage of air there-through. As the air on leaving the tubes in the boiler will still retain a considerable degree of heat, the same may be advantageously applied by being caused to pass through a further series of tubes contained in a suitable vessel, for preparing the water which is to be supplied to the boiler, by raising the temperature thereof, in order to the boiler being supplied with water at a considerable degree of temperature, by which heat may be advantageously employed in preparing the water for the boiler; or in place of such using of the heated air after it leaves the tubes contained in the boiler, such air will usefully disposed of by permitting it flow into the ash-pit of the boiler furn

Fig. 2.

at *d*, or otherwise into the furnace. Bell lays no claim to supplying heate to the furnace; nor does he confine self to the arrangement of boiler tubes described, as considerable v tions may be made depending on construction of the steam boiler, other circumstances; nor to any ticular arrangement of means for blow or by any other means causing h air to pass through the tubes of b in order to evaporate the water cont therein. Air has been forced by blo or otherwise, and caused to pass thr and amongst the fuel of furnaces thence through tubes passing thr boilers; he does not therefore any mode of using heated air for e ration where the air mixes with the ducts of the coal or fuel, and tog pass through the flues or tubes c tuting the flues of the boiler. Alth also he finds it preferable that the or vessels, through which the passed, in order to become h should be acted upon by the furna the boiler; yet such heating of th may evidently be performed by a rate fire. Mr. Bell claims, "the ca currents of heated air (unmixed wi products of the coal or fuel which

ass through tubes or other suit-
ies or cavities in or connected
boiler or other vessel, in order
re advantageously, to apply the
oduced to the fluids in the boiler,
purpose of heating and evaporat-
same."

understand that an eminent che-
Dr. Fife we believe), after months
riments with a two horse boiler
ordinary marine form, found the
to be 33 per cent. of the fuel,
the combustion was from 10 to
of coal to the cubic foot of water
ted; and from 40 to 43 per cent.
when the combustion was greater.
invention is, of course, applicable
ing and evaporating fluids gene-
As steam carries off with it 1170
of sensible and latent heat;
it is used, therefore, as a means
regnating fluids with caloric, as
r boiling, salt making, distilling,
can only impart to the fluids the
possesses above that point; but
air is reducible to the heat of the
rough which it passes, and must
re give off a much greater propor-
the caloric it derives from the fire,
team can possibly do. It is ap-
therefore, that air must be much
fficacious than steam, as the lat-
r all purposes of heating, must
wed to pass off in vapour, and
uently, to carry with it a great
tion of the heat obtained from the
e.

are informed that some more ex-
experiments are being made by
ell, which we will take an early
unity of publishing.

OVEMENTS IN ILLUMINATION BY GAS.

—In a late number of the *Mecha-
lagazine*, there is a notice of a new
l of using gas for illuminating
es, which is said to have been re-
invented in Paris, and to be attended
reat advantage in reducing the
ty of gas required to produce a
legree of light.

t may be presumed, that in any
rative trials which may have been
n Paris or in London, the burners
n the *new plan, have* been compared with such burners and chimnies as are generally used in these cities; we need not wonder that a decided improvement and economy were observed on the trial of any form of apparatus by which a check was given to the too free admission of air, which the ill-proportioned chimney glasses used in Paris and in London, are the causes of.

When the proposed plan comes to be tested by comparison with the well-constructed burners fitted with chimney glasses duly proportioned to them, the alleged advantage of this plan disappears, and we have the inconvenient substitution of a flickering light for a steady one, with the additional expense and trouble of a second glass.

The idea of increasing the illuminating power of gas by the application of heated air in its combustion, is not new here, as it was proposed soon after Mr. Neilson's patent for the hot blast was taken out; little encouragement, however, was given to proceed with experiments, when it was perceived that the end which it was proposed to gain, might be attained by cheaper and simpler methods.

In Paris, and in London, the consumers of gas, in the great majority of cases, pay at certain fixed rates per burner; they have, therefore, little interest in economising the expenditure, and it is notorious that they burn it in a wasteful manner; they have, however, a direct interest in breaking as few chimneys as possible, and hence we find that in London the chimney glasses are so disproportionately wide and long, that they pass four or five times as much air as is required for decomposing the gas and burning it advantageously, in respect to its illuminating power; this produces a double loss, as the degree of light which the gas is capable of giving is diminished, and the flame acquires a disagreeable pale tint, and a flickering unsteady motion, which is hurtful to the eyes.

In this city (Edinburgh) the majority of consumers are supplied by meter, and are interested in adopting the most economical methods of employing it; this has gradually led to improvement in the fittings, which has been carried so far, that the quantity of light required is not only provided at less expense than it would otherwise be, but the evils of smoke and smell (so much complained of in other places) are so much abated, that the best

drawing rooms in Edinburgh are freely lighted by gas without inconvenience.

The principles on which gas burners should be constructed, and their chimnies proportioned, were fully developed twelve years ago in a paper by the late Dr. Turner and Dr. Christison (read in the Royal Society of Edinburgh, May 1825, and published in Jameson's Philosophical Journal vol. 13) an attentive study of that paper would soon lead the London gas-fitters to the adaption of better patterns and proportions than they have hitherto employed.

A well constructed gas burner should exhibit a smooth uniform flame three to three and a half inches high, of a rich agreeable colour, not forked at top, and luminous nearly down to the holes from which the gas issues. To attain this (with economy in expenditure) the burner should be drilled with double or treble the number of holes generally put in them, or should have a fine slit cut all round*; the chimney should not be above five inches in lehgth, *i. e.* four inches above the edge of the burner; and its internal diameter should not exceed that of the burner by more than half an inch at most; three-eighths of an inch would be still better in careful hands. This close fitting of the chimney requires a corresponding accuracy in the fitting of the gallery which supports it, as a very small degree of eccentricity does away with all the advantage; while with well executed brass work and good glasses, the loss from breakage will be found to be less than in the ordinary run of ill fitted work with large glasses.

If to a well prepared burner of this kind an outer chimney for the supply of heated air be adapted, it will be found to add little or nothing to its illuminating power, while it will have the bad effect of rendering the flame unsteady and painful to the eyes.

A form of burner has been employed here for some time which answers exceedingly well for pendant lamps, and moveable branches, where the chimneys are subject to be shaken in moving the lamps; this form being described in Loudon's Encyclopædia of Cottage Architecture (page 1028) and a figure of it given, it would be superfluous to say anything further about it, than that when well executed it gives universal satisfaction; it is best used without moons.

As a proof that the advantage of attending minutely to the proper forms of burners and glasses is not illusory, it may be mentioned, that in two similar houses in the same street, each ofwhich is lighted throughout with gas, with as near as possible the same quantity of light, but in one of which no attention has been paid to the fittings, while in the other they have been carefully arranged on the best principles; the expenditure in the first house generally exceeds that in the second, although in this latter the whole cooking for the family (except roasting) is done on a range of gas stoves—the expenditure for the latter purpose may be between a fifth and a sixth of what is used for lighting, and is therefore the measure of the amount economised.

I remain, Sir,

Yours, &c.

K. H.

Edinburgh, December 1837.

* The expenditure does not depend on the number of holes in the burner, but on the height of the flame, which is of course regulated by the stop-cock.

PARLIAMENTARY REPORT ON STEAM COMMUNICATION WITH INDIA.

The Report on Steam Communication with India, which has just appeared, deserves great and general attention, both from the importance of the subject, and the amount of new and interesting information it contains. The latter remark applies, however, rather to the evidence which accompanies it, than to the Report itself, which only occupies a single page, and, for the reasons stated in it, avoids entering into the consideration of the various plans to which the evidence refers, or giving more than a very slight sketch of the position in which the matter stands. The demise of King William the Fourth, and the consequent dismission of Parliament, interrupted the Committee in the very midst of their labours, and left their investigation only half completed. They were obliged, therefore, to content themselves with reporting to the House of Commons their high satisfaction at learning that Her Majesty's Government and the East India Company had entered into the necessary arrangements for effecting a monthly communication by steam with Bombay, by way of Suez,

le, at the same time, they thought
' not to let slip even the present
unity of recommending that the
ages of the plan should be ex-
l, as soon as possible, to all three
encies. The following is the con-
g portion of the Report:—

iat inasmuch as, in the opinion of the
es who have appeared before your
ttee, a direct communication by steam
he Red Sea to Ceylon, Madras, and
, would be practicable at all seasons
ear, by the employment of vessels of
te tonnage and power; and as, under
us arrangements, such extended esta-
ent would appear to offer a prospect
dequate return for the increased out-
the conveyance of passengers, and of
aluable articles of merchandize, which
by expected from the limited com-
tion with Bombay alone; your Com-
feel bound to recommend a continued
alous attention to the subject on the
Her Majesty's Government and the
ndia Company. But, strongly as your
ttee are impressed with a sense of the
ages, political, commercial, and per-
which would arise from the more ex-
system of communication, they would
ly deprecate any interruption of the
e arrangements now in progress, with
it appears to them, from the evidence
d, to be perfectly compatible."

t the comprehensive plan will be
tely adopted, there can be no doubt.
d the experiment which is now,
o many years of useless and almost
untable delay, at length being
tried, succeed to anything like the
which may be anticipated by the
anguine observer, it cannot be sup-
that the other presidencies will
be left without a full participation
advantages which are, in the first
ce, to be enjoyed by Bombay alone.
rand object is, to effect the desired
r communication between England
me point or other of her Indian
sions,—it matters little which,—
l the rest will follow as a matter of
.

ill be seen that the Committee now
that the communication with In-
the Red Sea "would be practi-
at all seasons of the year." This
aps the most important result to
the labours of the present Com-
have led. It will be recollected
e former Committee, that of 1834,
ed the Red Sea line as undoubtedly
practicable for eight months in the year, while they entertained doubts as to the other four, on account of the south-west monsoon. It was for this reason that the Committee recommended the fitting-out of the Euphrates Expedition, as likely to discover the means of continuing the communication during the period in which the Red Sea line of communication might probably be interrupted. This recommendation turned out to be the most unfortunate that could have been made. Although the Committee expressly stated that they suggested it as a mere subsidiary experiment, and took care at the same time explicitly to recommend, without reference to the good or ill success of that experiment, the immediate formation of a Red Sea line of steamers; yet, by some fatality, the Euphrates Expedition came to be considered as the only natural fruit of the Committee's recommendation, and the attention of the public, and, as it now appears, that of the parties more immediately concerned, became fixed on the progress of the mere experiment, to the entire neglect of the far more important object which the Committee had pronounced to be quite within reach, and proper to be accomplished forthwith. The event has been, that several valuable years,—(to say nothing of some thousands of pounds sterling)—have been thrown away in prosecuting the exploration of the Euphrates, without one atom of good effect,—and that it after all appears indubitable that, if the more sober part of the Committee's advice had been taken with little of the zeal lavished on the other, it would have been found long ago that the Red Sea line might be navigated at every season of the year, and that, consequently, the experimental expedition might have been dispensed with altogether,—for the very plain reason that the supposed necessity for the aid of the Euphrates line has no real existence! The present Committee have wisely avoided the error of the former, and deprecate any fanciful interference with the means that have at last been taken for effecting the desired object in a straightforward manner. The splitting of interests caused by the struggles of each of the three Presidencies for priority; materially weakened their efforts in the cause; and it would be indeed a pity if some remnant of the same spirit should be suffered in the eleventh hour to inter-

pose, and perhaps cause further loss of time in a matter where delay has already been well nigh pushed to its extent.

The responsibility of this delay must be divided between the Government and the East India Company, at whose joint expense it was agreed that the communication by the Red Sea ought to be made. Sir John Hobhouse, the Chairman of the Board of Control, who was among the witnesses examined, appears to have felt that some explanation was due as to the causes of the delay in question, and to have been particularly anxious that the *onus* should not fall on the shoulders of the department over which he presides. With this view he entered into a rather lengthy detail of the proceedings both of the Government and the Company, during the period intervening between the breaking-up of the former Committee, and the appointment of the present—or between 1834 and 1837. From his narrative it would appear that some steps were immediately taken to carry the principal recommendation of the Committee of 1834 into effect. Thus, the Admiralty was directed to extend the voyage of the Government steamers from Malta, where they had hitherto stopped, to Alexandria; and the Directors of the East India Company sent orders,—though somewhat of the latest,—for their steamer, the *Hugh Lindsay*, to be dispatched with the mails from Bombay to Suez, between which ports she has up to this time made four voyages, with complete success. Sir John Hobhouse, however, does not take so much credit to himself for these measures as for his activity in carrying on the abortive expedition on the Euphrates. The extension of the Mediterranean steamers' voyage to Alexandria was effected by his predecessor, who, from other circumstances, seems to have been inclined to follow up the resolution of the Committee, but he expressly mentions that the measures for assisting Colonel Chesney's enterprize were taken by "the present India Board." At the same time he feels it necessary to offer some apology for the languid manner in which, under his guidance, the navigation of the Red Sea line was prosecuted; and this he does by observing that it was thought "as the Euphrates Expedition had been considered the first object to which the Government *ought to apply itself*, we (the India Board) should not be justified in taking any decisive steps before we had seen the results of that experiment."

Here is proof positive of the extent to which the delusion as to that unhappy business had spread. The President of the India Board himself takes shelter from the disapprobation he anticipates under cover of the very Report whose words "do most condemn him." Henceforth, it is plain, every separate Parliamentary Committee must confine itself to one separate and distinct recommendation; otherwise, the danger will be imminent of one so completely obtaining the upper hand, as to stifle and get rid of all the rest. The utmost explicitness is of no avail;—in this case the Committee not only strongly recommended the *immediate* adoption of the Red Sea line, without reference to the capabilities of the Euphrates line at all, but pointed out with precision in what way the expense ought to be provided for; and yet, with all this staring him in the face, we have Sir John Hobhouse gravely excusing his neglect to carry the main recommendation into effect, on the score that he did not think it proper to proceed until he knew how a mere collateral experiment might terminate!—It would appear almost a fortunate circumstance, on the whole, that it has terminated in a total and complete failure, since the favourite pretext for delay has thereby been altogether taken away, and the coast left clear for the effecting of the less novel, but far more practicable plan.

From Sir John's own statement it would appear that the Government authorities, and not, as might have been suspected, those of the East India Company, have had the greatest share in the procrastination which has taken place. It was the India Board which opened a negociation with the private Company formed for effecting Steam Communication with India; a negociation which answered no one purpose but still further delay. Why the Government should entangle itself with a "joint stock company," instead of aiming directly at the object, in the manner pointed out by the Committee of 1834, it would be hard to say; one thing is certain,—that, by virtue of the time occupied in pressing the Company to give in some specific proposal, (which they were very reluctant to do), in communicating their estimate in

m to theLords of the Treasury, rds of the Admiralty, the Post-General, and the East India Di- in obtaining the respective an-f all these respective bodies *seria-* ınd in transacting a variety of business with due official form, ıole matter was pushed off for months longer than it could ise have been. And after all, not-nding that the unanimous answer roposal given in was that it would ighly unadvisable" to accept it, was consequently rejected, it was the East India Company to re-e subject, and recall the attention Board of Control to the terms of ommittee's resolution. In their dated 1st February 1837, the Di- observe that they are of opinion e proposed communication ought effected by the Government and st India Company united,—that, other objections to a private com-hat of granting the power of levy-stage appeared to them insuper-and that they are quite willing to with Government the expense of a ly communication, *as they always een.* The Directors went further, ered, as the Government steamers o to and from Alexandria, instead lta, (which was the limit of the when the Committee made their t), to give up their claim to the f the postage from India to the erranean, and thus bear half the e without requiring any share in turns. This liberal proposal ap-to have stirred up the other side in degree; but the same story of de-ccasioned by the backwards and ds system at the Government , follows once more. Sir John ouse sends the proposal to the ary on the 2nd of February; he es no "precise answer" (not from but from Downing Street) till the arch,—and then it is insisted upon he plan shall embrace the whole Presidencies: this causes further ; another communication with the tors; ditto ditto with the Lords of reasury; the usual procrastination eir parts; further references to the India Company, the Admiralty, and 'ost Office; still further delay for cquiescence of the Treasury; and, y, to the honour and glory of the President of the India Board, the desired communication is begun *three whole years* after a Committee of the House of Commons had reported that it ought to be effected *immediately!*—Such haste as this may appear highly praiseworthy to a slow-going Cabinet Minister, but "the world in general" will be apt to term it unbearable and reprehensible tardiness. Even now, we should only be *in expectation* of the commencement of the proposed plan, had it not luckily happened that the East India Company had ordered the building of two steamers for it, by anticipation. Had all depended on the Government alone, or at least on the *present* India Board, it is probable that by this time the Admiralty would be in active correspondence with the Treasury, the Treasury with the Post Office, the Post Office with the India Board, the India Board with the Admiralty, and so on *ad infinitum;* while the object proposed might stand some chance of being carried into effect by this time ten years, if no "unforseen circumstances" should intervene! It certainly appears that the East India Company have not been so blameable for the delay as general supposition held them to be. They have not only sent out two excellent steamers, the Atalanta and Berenice, but have ordered a fourth (the "Hugh Lindsay" is in India already) to be built for the service, and have contracted for the immediate supply of a large quantity of coals to the stations of Mocha and Suez, which have been fixed on as ports of communication in the Red Sea. They have also desired the Governor-General to send one of the new vessels on a trial voyage from Calcutta to Madras, Ceylon, Socotra, and Suez, with an evident view to the extension of the present plan to Calcutta and Madras, as well as Bombay, should it be found easily practicable. This extension is almost the only thing remaining to be desired, after their present arrangements shall have been carried into complete execution. Most of the witnesses examined, together with Sir John Hobhouse himself, the Lords of the Treasury, and, as will have been seen, the present Parliamentary Committee, are decidedly in favour of the extended plan; nor is it easy to see why the East India Company should so strenuously object to it. As before observed, however, this is of the less consequence, that the suc ess of the

scheme as now determined on must soon ensure the adoption of the extended one.

The evidence given before the Committee, and which occupies almost the whole of the volume they have putforth, is, as usual in such cases, of exceedingly various degrees of value. Some of it is, indeed, little better than absolute trash; in this class must be included the testimony of Mr. Waghorn, whose name is familiar as that of an individual who has done much to keep attention alive to the subject of Steam Communication, and who has been of late years resident in Egypt, in the capacity of agent for the transmission of letters *via* the Red Sea. It is humiliating to find of what materials this "representative of British enterprise" is composed. First of all, he indites a letter to the Committee, addressed, oddly enough, "To the Steam Committee *in the Red Sea !*"—If this were not sufficient, the style of the letter would at once settle this personage's pretensions to common sense. What can be thought of an individual who sets about enlightening a Committee composed of gentlemen and scholars, by a composition, one of whose first phrases runs thus—"Many writers, especially of late, have endeavoured to give the public information, *by their prolific ideas,* about *this said* steam intercourse ?"—It is true, on the principle that "a stirring dwarf is more estimable than a sleeping giant," it may be contended that such a person as this may by dint of his mere animal activity and blind perseverance, effect more good than many a better man; but this admits of very considerable doubt. Almost every line of his evidence shows him to be brimful of prejudices, intolerant of all ideas but those which occupy his own small brain, and overflowing with a sense of self-importance. He winds up his examination by delivering his fixed opinion that it will be the bounden duty of the Committee to set forth his services in the cause to Parliament, with a view to a national reward (a duty which the Committee unaccountably neglected). He complains, also, of the Admiralty, for not according him the rank he wishes, and of the Government for once more allowing him to leave the country in debt. Yet, it appears, this ill-used individual had received liberal grants of money and plate from the Steam Committees of Madras and Calcutta, as well as from the merchants of London; and has just been appointed Deputy Superintendent of Mails in Egypt on the part of the India Board and East India Company, his first year's salary being paid in advance. All circumstances considered, it is not surprising, as it has turned out, that his first official feat, in Egypt, should be to quarrel with his superior officer, and write home in high dudgeon, with the evident expectation, that his principal should be dismissed, and himself raised to his place; and also with the evident desire, in case his anticipations should prove,—as of course they will,—unfounded, to do as much damage as he well can, to what he ridiculously calls "the steam object," so far as he is not himself concerned. It is almost painful to think that *such* a person can have rendered any services to SUCH an object; and, let his services have been what they may, it is quite evident that it would be far better to pay him ten times their highest possible value at once, than suffer his interference in the execution of the plan.

Most of the other witnesses are men of a very different calibre, but their evidence is in general so tinctured with prejudices in favour of the particular views they may have been led to adopt, as to lose by that means no small portion of its value. Thus, while Mr. Peacock, of the East India House, affords a vast body of information on almost every branch of the enquiry; he has so manifest a bias against the Red Sea line that it is necessary to make a continual allowance for his leaning in the opposite direction. This, of course, arises from the fact that Mr. P. was among the foremost champions of the unhappy Euphrates Expedition, and one whose arguments in its favour went far to induce the former Committee to hazard the resolution that the "experiment" ought to be tried. Now that the experiment has so signally failed that it is repudiated by all parties, Mr Peacock seems to take a chivalric interest in its defence, and labours hard to injure as far as possible, the rival and now popular line. This renders it a difficult matter to obtain favourable facts from his lips, while the unfavourable drop from them without asking. It is the same, in a degree, with many others;—almost every witness has some favourite and peculiar plan to support, and some

obnoxious one to crush, so that, when the direction of his bias is discovered, it is necessary to take his evidence,—as to its general complexion, at least, if not as to particulars,—with "a grain of salt." Some are for recommending a particular port as a station: in this case the harbour becomes completely landlocked,—except with certain winds,—and the entrance is always practicable,—except at certain times of the tide. The next witness has a pet port of his own, and he assures the Committee that the same harbour (which HE wishes to run down) is open to all the winds which usually blow in that part of the world, and has a bar at its mouth preventing all ingress except at high tides, and then only for an hour at a time! It may be very reasonably doubted, whether it answered any useful purpose for the Committee to pursue these minute enquiries. The details of the measure, when once its outlines were resolved upon, might safely be left to other parties than a Parliamentary Committee of the most heterogeneous materials, sitting some thousands of miles from the scene of action, and founding their opinions on evidence of, certainly, a very desultory character. If the Committee of 1834 had not busied itself to such an extent with a minute enquiry into the probabilities of effecting a practicable line by way of the Euphrates—their opinion on which, was after all erroneous—steam communication with India by the route of the Red Sea would, in all probability, have been by this time at least two years in full operation.

Among the information elicited, of the greatest and most general interest, may be noticed that relating to the only portion of travelling by land which will occur on the intended route,—the passage of the Egyptian desert, the "narrow tongue" connecting Africa with Asia. Most of this is contained in the evidence of Mr. Alexander Galloway, the well-known engineer of Smithfield, and father of the equally well-known "Galloway Bey," of whose services as engineer to Mahomet Ali the mechanical world at home has heard so much.

From time to time very contradictory reports have been circulated in England as to the Railway projected by the Pasha across the isthums of Suez, and the progress made in reducing the idea to practice. Mr. Galloway's information is highly interesting on this point, especially as, from his position and pursuits, its authenticity may of course be depended upon. It appears that the Pasha has entered with such spirit into the plan, that he has now in his possession the rails and materials sufficient for one third of the whole line, with engines and other apparatus, to the value of 200,000*l.*—nearly the whole of which was sent out from England. Mr. Galloway attributes the suspension of operations which has taken place to the lukewarmness of the English Government towards the project. Galloway Bey applied to the Home authorities in 1834, and assured them that the Pasha only required to be encouraged in the prosecution of the undertaking, by a declaration on the part of our Government, that they were willing to pay a reasonable mileage on goods making use of the railway, without insisting on any stipulation in regard to passengers. This declaration Mr. Galloway intimates, the Government either declined or neglected to give, a circumstance which he attributes to their attention being then entirely taken up with the everlastingly recurring expedition to the Euphrates. It is probable, however, that the Pasha himself paused as much on account of that expedition, as for want of the required assurance. If his railway be made use of, of course he will be paid for it; there needs no previous stipulation to secure his right to a mileage; but he might well hesitate to proceed when he saw with how much zeal the Euphrates Expedition was carried on, whose object was to avoid Egypt altogether; and he might well suppose that there were good grounds for expecting the discovery of a practicable line in that direction, when he saw the route by the Red Sea, though already known to be practicable and easy, lost sight of far the time in the engrossing interest inspired by the Euphrates project. He may now resume his railway, without much fear of competition in that quarter, and either with or without previous stipulations, since he will enjoy a complete monopoly of the line. Mr. Galloway, however, is of opinion that it will require the impetus of a resolution of the Committee, or some similar degree of encouragement, to induce him to recommence his operations.

Mr. Galloway handed in a plan of the intended line of railway, from the survey

made by his son, by order of the Pasha. It commences at Cairo, proceeds easterly in a straight line to a point nearly north of Suez, where it turns to the southward, and reaches the Red Sea, or Sea of Suez, at its northern extremity. It is here intended to terminate in a pier, projecting considerably into the sea, for the purpose of facilitating the loading and unloading of vessels. The total length of the line is about eighty miles, so that the desert might be crossed by it in four hours. The journey now occupies three days of what is considered quick travelling, although by a dromedary-express it may be traversed in one. Mr. Galloway calculates that, when the railway is laid down, aud steam-vessels are established on the Nile, the whole of the passage from Alexandria to Suez may be made in from twenty-four to thirty hours, instead of eight or ten days, as at present. The Pasha has already one steamer on the Nile, the engines of which were made by Boulton and Watt, and he contemplates adding to the number. Mr. Galloway states that there are no engineering difficulties on the line of railroad, the ground being good, and the levels more favourable than on any eighty miles of railroad in England. There would be no tunnel required, although it would be necessary to execute four million yards of cutting. Exclusive of cutting, the total expense is estimated at 600,000*l.*, or 7,500*l.* per mile, and the materials, as already observed, for twenty miles are actually on the spot, and have not, as had been reported, been used by the Pasha for other purposes. He has, indeed, a railway for the conveyance of stone from the Mokaltam Hills to Cairo, but the rails for this are only 36 lbs. to the yard, while those for the Suez railway are not less the 60 lbs.

Mr. Galloway furnishes incidentally some interesting particulars of the progress of the Egyptians in the useful arts. He calculates that there are now as many as five thousand workers in iron in the country, a great number of whom are employed in the Pasha's foundry at Boulak, near Cairo, which was set up a few years ago, under the superintendence of Galloway Bey, and is now "one of the first iron foundries in the world." Forty or fifty of the artificers employed, chiefly engineers, are importations from England, the remainder of the five thou*sand are all natives,* who have acquired such skill, that muskets are now manufactured at Boulak without assistance Machinery is still imported from England, but Mr. Galloway anticipates that there would be no difficulty in effecting repairs of the steamers and engines, if necessary, at Suez, especially when the railway should be in existence, to offer the utmost facilities of transport from Cairo. Mr. Galloway, like most of the remainder of the witnesses, treats the plague as an obstacle of little importance. There can be no doubt, nevertheless, that the plague, and the probability of a devastating war, especially in case of the death of Mahomet Ali, offer the most serious obstacles of any to the continued regularity of the Red Sea line. It is by no means improbable, at the same time, that the very establishment of steam communication by that route, especially if combined with the execution of the projected railway, would exercise a considerable, if not a commanding influence on the future progress of events in Egypt; and that the question of peace or war may, in the course of a few years, be influenced by, instead of, as now, influencing the introduction of steam-power as a means of conveyance in the East.

Mr. Galloway's evidence, taken together with that of Mr. Briggs, a partner in an eminent mercantile house established in Egypt, affords an insight into another point of interest;—the means taken of late years to obtain a supply of water in the deserts. It appears that on the line of road across the desert from Cosseir on the Red Sea to Keneb on the Nile, which is at present the one most in use by travellers from India, strenuous endeavours have been made to construct Artesian wells by the now common process of boring. Two borers from England, assisted by a Swiss mineralogist, were actively employed in 1831 and 1832 in the search for water, under the "patronage" of the Pasha, and his son Ibrahim, but at the *expense* of a benevolent English gentleman, whose name is not mentioned. Plenty of water, and that of good quality, rewarded their exertions, so that there is now no want of the article of primest necessity in that locality: the same parties were also subsequently employed in a similar search on the road across the isthmus of Suez, but not with the same measure of success. At one time their object seemed near its attain-

a fine spring having been dis- about half-way across the desert; r flowing for a short period, the supplied began to dwindle, and g has since entirely disappeared. ha, however, intends to continue rch on his own account;—the ith which Mr. Briggs is con- aving since sent out to him from l forty drills for boring, the rods ch could easily be made at the own factory. It does not appear has prosecuted the object with nergy of late, but that also, as the suspension of the railway, attributable to his fears lest the line should be rejected by the Government, and these will of e removed now that its adoption ed on. It may be observed, that, to his entertaining the idea of a Mahomet Ali had turned his s towards the forming of a car- ad across the isthmus, which is y traversed on the backs of dro- s, camels, or asses; several years . Briggs's house exported a com- glish stage-coach to Egypt, on the one of the Pasha's high officers. intended for the proposed coach- ut, as the latter has never yet de, the former is of course of no he Pasha himself is the only in- who has yet crossed the desert eeled vehicle; this was many o, when on his way to complete image at Mecca, and the carriage e of was a common English four barouche; rather a singular lity to be met with in the Egyp- erts, and facilitating the progress e Musselman to the Prophet's

ether, the evidence referring to sing of the isthmus is so satis- as to remove all reasonable of objection on that score. It resent no very serious obstacle, w, to the transit of passengers mail, while, should the Pasha ut his project of the railway, it ly cause the detention of a few The railway will be attended other advantage; supposing that a's endeavours to discover water ll fail, it will evidently be of little ence when four or five hours ce to transport the whole train from emity of the desert to the other.

It is gratifying to find, that the importance of effecting steam communication with India, which seemed at least to be passively denied in some influential quarters, is now generally, it may be said universally, recognized. Lord William Bentinck, the late Governor-General, who presided at the Committee, gave his most decided opinion, with his reasons at length, in its favour. This, indeed, might have been looked for, as his Lordship, when in office, was always an ardent admirer and energetic promoter of the project. He acknowledges, however, that his prepossessions in its favour have increased tenfold since his return to England, while his opinion of its practicability has been confirmed till "strong as proof of holy writ" by the enquiries as to the power of steam which he has had the opportunity of prosecuting at home. We have already observed that the experienced parties examined all concur in considering that the great bugbear of the Red Sea line,—the prevalence of the south west monsoon for four months of the year,—need not excite the smallest alarm. On all hands, no doubt is now entertained that the steamers may proceed, in spite of the monsoon, at all seasons of the year, if proper management be called into action, and steamers of proper power made use of. The Hugh Lindsay, which has had the greatest share in the few experiments that have been made with a view to test the practicability of the plan, is condemned on all hands as a most inefficient vessel, and yet she has answered expectation in almost all her voyages. The two steamers now in the East Indies, the Atalanta and Berenice, are vessels of a widely different, and of a far higher character, in every respect: they are probably two of the finest steam-packets now afloat, and are therefore well calculated to give the project all that it requires, but has not yet obtained a fair trial. One of these vessels, the Atalanta, we are told in Mr. Peacock's evidence, steamed at one stretch from Fernando Po to the Cape of Good Hope, a distance of 2,400 miles, which she accomplished in fourteen days, although in the face of the south-east trade-wind; and, on arriving at the Cape after this long run, her supply of coal was not yet exhausted! With steamers such as these the result of the experiment (if "experiment" it may be called)

of communication by the Red Sea line, need not be doubted for a moment; their signal success on the longer and older line of traffic may even give an impetus to the project which has been broached of establishing steam-navigation by that line also. There is ample room for both to be carried into effect with advantage; but the great value of that inestimable article, time, must always tend to secure a preference for the shortest practicable way from place to place, on the part of passengers at least, although it may be different with regard to merchandize.

Lord William Bentinck was not the only high Indian functionary who gave in his adhesion to the plan. The Hon. Mountstuart Elphinstone also spoke warmly in praise of the advantages it might be expected to confer both on the natives of India and their rulers; while Sir Alexander Johnston, the Ex-Judge of Ceylon, added his testimony to the same effect. Sir Alexander's evidence is of a very curious and novel character; he is well known as the introducer of Trial by Jury into Ceylon. He has also exerted himself to bring to the knowledge of the Cingalese many European peculiarities, which he believed likely to tend to the amelioration of their manners: among other, (as some would call them) rather fanciful plans, he induced his friend Joanna Baillie to write an English tragedy on a Cingalese subject, entitled "The Bride," which he afterwards procured to be translated into the language of Ceylon, and represented on the stage for the moral edification of the natives. Sir Alexander expected, by this gentle and agreeable means, to root out of the character of his protegés certain blemishes which a less benevolent teacher would have taken far stronger measures to eradicate; but we have not learned what degree of success attended the experiment. True to his reputation for eccentricity, the worthy Baronet takes a different view of the good effects to be anticipated from the proposed measure, from any of the other witnesses; he expects that it will cause many of the richer natives of India to come and reside a few years in England, and that the best consequences will follow their return, thoroughly imbued as they will be with the literature, the science, and the social manners of England. The Rajah Rammohan Roy, he informs the Committee, when he was in the country, and shortly before his death, placed in his hands a treatise he had written, in the style of Cicero's Tusculan Qnestions, and arranged in the form of a dialogue between "a Brahmin from the Thames" and "a Brahmin from the Ganges," in which both concur in recommending all of their countrymen, who can afford it, to pay a visit to England, and their acquire the knowledge which is not within their reach at home. Nor was this all. The Rajah also assured him that eighteen Brahmins and four Rajpoots had, in consequence of what he had written to them as to the manner of his reception in England, authorized him, in case of the intended plan of Steam Communication through Egypt being effected, to purchase land for them in England, with the intention of residing for some years in the neighbourhood of London, and making themselves acquainted, by personal study and inspection, with the laws, the arts, and the institutions of Great Britain!

Whatever degree of importance may be attached to these curious facts, there is quite enough reason good, in the main body of the evidence, to justify the Committee in congratulating the House and the country on the actual commencement, at length, of the long-desired and long-protracted plan of "Steam Communication with India."

TRANSACTIONS OF THE INSTITUTION OF CIVIL ENGINEEERS.

We are glad to find that the reading public have not to wait until "next year" for a fuller record of the transacactions of the Institution of Civil Engineers than the short "Minutes and Proceedings" noticed in a recent number of the *Mechanics' Magazine*, but that, in point of fact, the world has already been favoured with a quarto volume of very respectable dimensions, devoted to an exposition of the labours of the Association on a scale commensurate with their value and importance.

The volume in question,* commences with an "introduction" comprising a well-drawn sketch of the rise and progress of Civil Engineering, as a separate

* Transactions of the Institution of Civil Engineers, Vol. I. London, Weale, 4to, pp. 335, plates.

of study and practice in this y, with brief memoirs of all the celebrated professors of the science, us to the existing generation. are not many in number, but they cluster of stars of the first mag-, among which the names of ley, Smeaton, and Telford shine extraordinary brilliancy. This ge- ntroduction is followed by another, a view of the origin of the Insti-, the commencement of whose sactions" it precedes. The whole "eventful history" is highly in- ng; after tracing the progress of of the principal scientific bodies existence, commencing with the Society, the narrative proceeds :—

ie Institution of Civil Engineers is of scent origin than most of the societies lluded to; but the profession itself of ancient date, and while it was still its members adopted the principle of Their first society, or rather club, ablished under the auspices of one of liest and greatest of them, the illus- Smeaton, in 1771, and reorganized in —its history is given in the preface aton's Reports, which were published ub-committee of its members. The still exists, under the name of the tonian Society of Civil Engineers," g monthly during the Session of Par- t at the Freemason's Tavern,—and s, as it has done from its foundation, f the most eminent men in the pro-, with associetes from the ranks of ge- cience. But, though this society had nswered a good end, its constitution was exclusive a nature to meet the wants rge and mixed a body as soon became d in engineering, and a feeling began enerally entertained that, in addition n institution on a larger scale, having object the furtherance of professional dge, might be made eminently useful, s indeed due to the profession from ngaged in it.

was towards the end of the year 1817, few gentlemen,* then beginning life, sed by what they themselves felt with ficulties young men had to contend gaining the knowledge requisite for fied practice of engineering, resolved a themselves into a society for pro- a regular intercourse between per- ngaged in its various branches, and thereby mutually benefitting by the inter- change of mutual observation and experience. The first meeting of the embryo society was held at the King's Head Tavern, Cheapside, on the 2d of January following, when a series of rules were adopted for its government, and these rules were, and with some modifi- cations and additions continue to this day to be the basis of the fundamental laws of the Institution of Civil Engineers, which in- deed dates its birth from this meeting."— p. xx.

For the first two or three years the infant society pursued "the noiseless tenor of its way" without attracting any attention out of its own immediate sphere. It may be said, indeed, to have been a mere private society, until its members conceived and acted upon the happy idea of inviting an engineer of acknowledged eminence to fill the chair. It was not every engineer of this descrip- tion who would "come" when the So- ciety "did call for him," but by good fortune TELFORD was pitched upon, and by no less good fortune, he was not disinclined to accept the office.

"So little was the society known up to this time, that Telford had never heard of its existence when the foregoing resolution was announced to him; but appreciating with characteristic judgment the value of such an institution, and the useful results it was capable of yielding, he accepted the proposed chair without hesitation, and was formally installed on the 21st of March following.

"Telford's name gave a new impulse to the progress of the institution, which grew rapidly in importance under his foster- ing care, until, on the 3d of June 1828, it received a charter of incorporation under the Great Seal, by the title of "The Institution of Civil Engineers." By that act of royal grace its standing was confirmed, and its prosperity has since been uninterrupted by any untoward event, save the lamented death of its great president. The circumstances under which he became connected with the Institution have been detailed. A few years after, he began to contract his engagements, and, as he gradually withdrew from the toils of business, his attention became more and more concentrated on this, as it were, his only child, and the last object of his solici- tude; the care of which gave employment to his mind in the evening of his days, free from the too violent excitement apt to be produced by the active duties of professional life. The rising society then occupied much of his time and more of his thoughts,—its collections were enriched by his bounty,—

* srs. William Maudsley, Henry R. Palmer, Field, James Jones, Charles Collinge, and shwell.

and when, full of years and honours, he felt the close of life approaching, he endowed the Institution with a munificent bequest."—p. xxii.

It is apparent from this statement, that, although the Institution was in existence for some time before Telford became connected with it, the accession of his name and fame, as well as of his personal exertions, had so important an influence on its progress, that he may well be considered as its founder in its present shape. Without him, it is doubtful if the Institution would ever have emerged from its primitive obscurity, and, had it not been for the zealous interest he took in its prosperity, there can be no doubt it could not have so soon attained its present high standing in the world of science. Nor are the members of the Institution backward in acknowledging their obligations to their late illustrious president; his portrait graces this first volume of their transactions, and they apologise for not devoting a greater portion of the body of the work, to the detail of the great undertakings in civil engineering accomplished by his genius in every part of Britain, by alluding to the forthcoming full account of them, from his own pen, which has now for some time being almost daily expected to appear, and will of course supersede all its necessarily imperfect precursors.

The "Transactions" themselves open with an extremely full and elaborate account of the stupendous docks of Hull, by Mr. Timperly, which is illustrated by numerous beautifully-executed engravings from drawings by the same gentleman, which do honour to his skill and ability. From among the numerous excellent papers which follow, we have selected for extract one on the discovery of the hot-air process of smelting-iron, which has been contributed by its inventor, Mr. Neilson. The selection has been made as much on account of the (comparative) brevity of the paper, as of its intrinsic interest, though the latter might well justify the choice. It is seldom that we meet with an account of the origin of a great invention, from the only person who could possibly be cognizant of all the circumstances,—the inventor himself,—and still seldomer with one so satisfactory and complete as that *supplied by Mr. Neilson* of the discovery which bids fair to introduce a new era in our must important manufacture. There is only one thing to complain of; this like the rest of the papers, is,—for what reason it is difficult to imagine—printed without the place or date at which it was written. This strange omission, always annoying, is here quite inexcusable. Mr. N. talks of "seven years ago," and "this neighbourhood";—it is of consequence that the reader should therefore be able to fix the date of his communication, on which that of the discovery depends,—and the place, as essential to its history; but notwithstanding, the paper (originally in the form of a letter addressed to the president) is printed without either, and no means are afforded for supplying the deficiency. In this instance, we should conjecture the place to be Glasgow, and the date about 1835, but for the materials of this conjecture recourse must be had to other works than the Civil Engineers' Transactions.

The following is Mr. Neilson's narrative:—

"I feel much pleasure in being able to comply with your request in mentioning to you what I conceive to be the nature of the advantages likely to be derived by the iron trades, and the country generally, from my invention of the hot blast, and at the same time, I shall very willingly state the circumstances, agreeably to your request, which, in the first instance, led me to direct my attention to the improvement of the process of iron making.

"About seven years ago, an iron maker, well known in this neighbourhood, asked me if I thought it possible to purify the air blown into blast furnaces, in a manner similar to that in which carburetted hydrogen gas is purified; and from this gentleman's conversation, I perceived that he imagined the presence of sulphur in the air to be the cause of blast furnaces working irregularly, and making bad iron in the summer months. Subsequently, to this conversation, which had in some measure directed my thoughts to the subject of blast furnaces, I received information that one of the Muirkirk iron furnaces, situated at a considerable distance from the engine, did not work so well as the others; which led me to conjecture that the friction of the air, in passing along the pipe, prevented an equal volume of air getting to the distant furnace, as to the one which was situated close by the engine. I at once came to the conclusion, that by heating the air at the distant furnace, I should increase

its volume in the ratio of the known law, that air and gases expand as 448 + temperature.

"*Example.*—If 1000 cubic feet, say at 50° of Fahrenheit, were pressed by the engine in a given time, and heated to 600° of Fahrenheit, it would then be increased in volume to 2104.4, and so on for every thousand feet that would be blown into the furnace. In prosecuting the experiments which this idea suggested, circumstances became apparent to me, which induced the belief on my part, that heating the air introduced for supporting combustion into air furnaces, materially increased its efficiency in this respect; and with the view of putting my suspicions on this point to the test, I instituted the following experiments:—

"To the nozzle of a pair of common smith's bellows, I attached a cast iron vessel heated from beneath, in the manner of a retort for generating gas, and to this vessel, the blow-pipe, by which the forge or furnace was blown, was also attached. The air from the bellows having thus to pass through the heated vessel above-mentioned, was consequently heated to a high temperature, before it entered the forge fire, and the result produced, in increasing the intensity of the heat in the furnace, was far beyond my expectation, and so evident as to make apparent to me the fallacy of the generally received opinion, that the coldness of the air of the atmosphere in the winter months, was the cause of the best iron being then produced.

"In overthrowing the old theory, I had, however, established new principles and facts in the process of iron making, and by the advice and assistance of Charles Macintosh, Esq., of Crossbasket,* I applied for and obtained a patent, as the reward of my discovery and improvements.

"Experiments on the large scale to reduce iron ore in a founder's cupola, were forthwith commenced at the Clyde Iron Works, belonging to Colin Dunlop, Esq., which experiments were completely successful; and, in consequence, the invention was immediately adopted at the Calder Iron Works, the property of William Dixon, Esq., where the blast being made to pass through two retorts placed on each side of one of the large furnaces, before entering the furnaces effected an instantaneous change, both in the quantity and quality of iron produced, and a considerable saving of fuel.

"The whole of the furnaces at Calder and Clyde Iron Works were in consequence immediately filled (fitted?) up on the principle of the hot blast, and its use at these works continues to be attended with the utmost success; it has also been adopted at Welsontown and Gartshirrie Iron Works in Scotland, and at several works in England and France, in which latter country I have also obtained a patent.

"The air as at first raised to 250° of Fahrenheit, produced a saving of $\frac{2}{7}$ths in every ton of pig-iron made, and the heating apparatus having since been enlarged, so as to increase the temperature of the blast to 600° Fahrenheit and upwards, a proportional saving of fuel is effected; and an immense additional saving is also acquired by the use of raw coal instead of coke, which may now be adopted. By thus increasing the heat of the blast, the whole waste incurred in burning the coal into coke is avoided in the process of iron making.

"By the use of this invention, with $\frac{3}{7}$ths of the fuel which he formerly employed in the cold air process, the iron-maker is now enabled to make $\frac{1}{3}$rd more iron of superior quality.

"Were the hot blast generally adopted, the saving to the country in the article of coal would be immense. In Britain, about 700,000 tons of iron are made annually, of which 50,000 tons only are produced in Scotland; on these 50,000 tons, my invention would save in the process of manufacture, 200,000 tons of coal annually. In England, the saving would be in proportion to the strength and quality of the coal, and cannot be computed at less than 1,250,000 tons annually; and taking the price of coals at the low rate of 4*s.* per ton, a yearly saving of 296,000*l.* sterling would be effected.

"Nor are the advantages of this invention solely confined to iron making; by its use the founder can cast into roods an equal quantity of iron in much less lime, and with a saving of nearly half the fuel employed in the cold air process; and the blacksmith can produce in the same time $\frac{1}{3}$rd more work, with much less fuel than he formerly required.

"In all the processes of metallurgical science, it will be of the utmost importance in reducing the ores to a metallic state."—p. 81.

This interesting narrative, combined with the report of M. Dufrenoy, on the hot blast system, a translation of which appeared in the *Mechanics' Magazine* for 1835, presents a complete view of the history and advantages of the discovery. As to the amount of the latter, differences of opinion still exist, and may be expected to exist, until the unerring

* The patentee of the caoutchouc manufacture so well-known by his name.—ED. M. M.

process of actual experience shall have determined the relative strength of the hot blast and cold blast iron. But, whatever these differences may be as to the degree of importance attached to Mr. Neilson's discovery, there can be none as to its great utility and merit generally, and as little with regard to the simplicity and interest of his history of its progress from conception to execution.

There is another point of difference among engineers, on which we have a paper in this volume;—the duty performed by the Cornish pumping engines. The paper is contributed by Mr. Wicksteed, who was commissioned by a London water company to examine the engines in question, and make his report, both as to the reality of their performances, and their adaptation to the usual purposes of water-works engines. Mr. W.'s opinion is favourable on both these heads. As to the former he has no hesitation in making up his mind, after stating the performances of the engines he actually saw at work, he adduces the various reasons which lead him to believe that, even if the parties concerned were inclined to resort to deceptive practices, it would be impossible to carry their intentions into effect:—

"But supposing, for the sake of argument, that the engineers, and the agents of the mines, were so disposed, and could get these gentlemen (the coal-agents) to combine with them for the purpose of making a false report, the insanity of such a proceeding will, I think, appear evident on a perusal of the following statement:—

"The engines is Cornwall are designed, the drawings made, and the construction and erection of the machinery superintended, by gentlemen who are appointed as engineers to look after the machinery of the mines. The castings are made, and the work designed by the said engineers is executed at two large 'foundries,' or engine manufactories at Hayle.

"There are more than twenty engineers employed in the mines in Cornwall, all of whom are anxious to construct the best engine, as the parties producing the engines that do the most duty obtain, of course, the most employment. It is therefore a matter of jealous attention on the part of these gentlemen to take care that no engine shall have undue credit for doing the most work. It happens occasionally, where a great improvement has been made, that doubts are expressed as to the accuracy of the reported duty: in such cases the engineers and agents of the other mines call upon the parties whose engine is reported as performing extraordinary duty, to allow them to prove *it*; this call is answered by fixing a time for the trial—the trial lasts for two or three days, during which time the engine is in the hands of the rival parties, who are on the watch to detect unfair play, if any should be attempted. If the result of this trial is favourable, the party in question receives due credit; if otherwise, his character as an honest man is lost. If this is not as severe a test of the accuracy of the reports as can be made, and not sufficient,—then, indeed, prejuce must have its full swing, and no further *proof* can be given, as gentlemen going into Cornwall from London and elsewhere, for the purpose of proving the truth of the statements made by the Cornish engineers, may with equal justice be charged with making false reports."—p. 120.

With respect to the question of applicability and relative economy, Mr. Wicksteed's tone is equally decided: he winds up his paper thus:—

"In conclusion, I beg to observe, that if the Cornish engines do the work that it is stated they do, and if they are applicable to water-works purposes, *of both of which I have no doubt*, then the saving is most important; for supposing instead of *three* engines, consuming 3,000 tons of coals per annum, *one* could be erected doing the work of the three, and only consuming 1,000 tons, assuming the price of coals delivered to be 18*s*. per ton, the saving in coals alone, without reference to the savings in the reduced number of engine-keepers and stokers, the current expenses of one engine instead of three, the wear and tear of machinery, and buildings, would be 1800*l*. per annum."—p. 130.

Mr. Wicksteed's paper is almost immediately succeeded by another referring partially to the same subject; a communication from Mr. Seaward, on the system of boring for "artesian wells" especially as applicable to the supply of water to cities and towns. Mr. S. gives his voice most decidedly against resorting to this method, except in situations where the two more natural sources of supply, running streams and rain-water, are not accessible. The opinion is fortified by reference to sundry cases of failure in the object sought, after great expense incurred, which would have been far more forcible had Mr. S. favoured his readers with fuller particulars, especially as to locality,

, at present, they are left to guess m very slender data. Mr. S. after l instances of this unsatisfactory cter, sums up this :—

Ve could add many other instances of tal failure of what is called the simple system; of works begun and never d to any useful purpose: of others aciously carried on for four or five until the patience and the funds of rties were alike exhausted; but we enough has been stated above to to your satisfaction how very uncer- as been this method of obtaining We think it right, however, to against the impression that boring for is a bad system; on the contrary, is to repeat that we think most highly but then only under proper manage- and as a useful auxiliary to the sink- capacious wells.

Vith respect to the project generally, ning a regular establishment for the e of supplying water to the various of France, we have to remark, that can exist no physical impediment to complishment of the plan; there is stion but every town in France might de to enjoy the same inestimable ages possessed by the inhabitants of n and other towns in England: that say, a constant, abundant, and an nical supply of good water, for all es of domestic and manufacturing ut of the three modes by which this accomplished, boring or well-sinking idedly the most expensive, and the ncertain in the final results."—p. 150.

s not this last paragraph abound uch in phrases of a conventional ter? The supply of water to don and other towns in England" e vastly superior to that enjoyed towns on the continent, but we on whether it can, unless compa- y, be termed an "abundant and nical supply" of "*good* water." eaward's own narrative itself would to point to a different state of . The manufacturers, of whose to obtain a supply on their own es he tells us, must be mad l, to run to so great an expense ncur such an infinity of trouble attainment of an object which ling to him, is already within grasp! The truth is, they find to ost, that the supply is by no means ndant," and far, very far indeed "economical," while an additional to persevere in "boring for water" at any expense and risk is constantly given by the operation in various ways of the grinding monopoly of the great companies which hold under their control the supply of one of the prime necessa- ries of life. As to the "goodness" of the water in London, the least said the better, when it is considered that it is chiefly procured from that 'great com- mon sewer, the Thames, after it has received the filth of the greatest portion of the greatest city of the world into its bosom, it must be obvious that to talk of its purity would be ridiculous. It is true, that the inhabitants of a large section of the capital are comforted with the idea that *their* supply is free from the taint, and that they derive the whole- some element from the great work of Sir Hugh Myddleton: but this is a mere delusion. The little canal which might hope to supply the London of James the First's time, could hardly hold out against the demands of the London of the present day, even in its palmiest state, much less in the droughts of summer, when its stream (?) is reduced to a mere runnel. To make up for the deficiency, old father Thames is resorted to, and that part of the supply which has just run to waste down the sewers stands a fair chance of being made to do duty again, and so on *ad infinitum*,—in company with whatever other matter it may have met with in its progress through the minor receptacles of filth to the great receptacle of all. That by this process the fluid furnished, soon ceases to be "good water," a convincing proof is offered by the stench emitted from the compound in a short time after its being "abundantly" supplied. If there is no easy way to remedy the evil, as Mr. Seaward assures us, so much the worse; but, in the meantime, while "such things are," let him refrain from boasting of the "inestimable advantages" of the exist- ing system.

Many of the remaining contributions in the volume are of the highest excel- lence, but we have not space to notice them as they deserve. Among the most prominent are, an account of the con- struction of the Lary Bridge, near Ply- mouth; some experiments on the ex- pansion of water by heat, by the late Mr. Tredgold; a very long collection of tables of the velocities attained by boats on canals, furnished by Mr. Macneill,

heretofore *well known* for his exertions in that branch of research; and the details of the erection of a singular bridge over the Dora Riparia, near Turin, a curious and creditable specimen of Italian engineering: these are contributed by a gentleman whose name "Benedetto Albano," would indicate a foreign origin, but who, we observe, is a regular London member of the Institution. Similar details are also given as to the celebrated bridge at Chester over the Dee, the arch of which is of wider span than any other in the world; and the articles relating to both bridges are illustrated by steel-engravings of first-rate execution. Mr. Borthwick supplies an excellent paper on "cast-iron piling, especially that at the Brunswick Wharf of the East India Docks:" it enters completely into the subject, and embodies a vast quantity of information, but there is one blemish which we are sorry the author or the Institution did not remove; the article concludes with a quotation, without which the text is unintelligible, from the Swedish chemist Berzelius, and this is given *in French*. It would have been easy to add a translation, or even to have given the extract at once from Mr. Children's translation of the treatise, and this should have been done. English surely has every right to be the language used in a book devoted to a science so pre-eminently English as civil engineering, especially when that book is published in England, and for the benefit of Englishmen.

ETTRICK'S IMPROVED METHOD OF JOINING STEAM-ENGINE AND OTHER BOILER-PLATES TOGETHER.

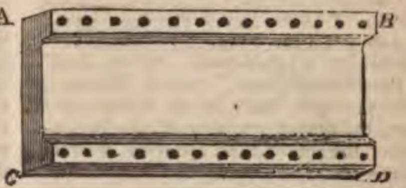
It is singular that whilst every part of the steam-engine, the boilers not excepted, should have been progressively receiving various improvements yearly, nay, daily, the greatest defect, namely, the loss of material and strength, by the imperfect method of joining the metal plates of steam-engine boilers together, should have been wholly overlooked, if I except the paper read at the British Association two years since by myself, "On a method of joining steam-engine boiler-plates by elliptical instead of the present form of circular clenches." This paper will be forwarded as soon as received from the Secretary of the Association in whose hands it now lies. About the same time that this improvement occurred to me the one of which I am now writing did so likewise; indeed I am not certain but that they were both included in the same paper. It consists of additions, or raised projections, which by adding strength to the edges of the plates, (where the metal is so much weakened by the holes cut in it), we shall be enabled to keep them of equal strength throughout. The great loss of strength by the removal of so much metal from the plates must have been noticed by every one conversant with steam-engines, but to set the defect in a clear point of view *before those not so* well versed in these matters, I will make a drawing which will fully show it.

Let A, B, be piece of iron plate, having the parts A, B, made thicker than any other part so as to obtain equal strength. Then if we attempt to tear the metal asunder by the ends A, and B, the plate would have no more tendency to give way at one place than another; but if we make one or more holes at a, or b, in such case the plate would be divided at one of those places. Just such is the case of the boiler-plates of steam-engines, where we have, as it were, this very plate cut across at x, y, and the hole of the half b, laid over the hole of the other half a, the two being fastened together by a clench. Now I find, that the plates may be so formed as to be equal in strength throughout, which is accomplished by elevating the edges of them, or leaving more metal in these, than in the central parts, the thickness there being twice as much as in any other place. The form of plate is distinctly shown by figure 1, A, C, D, B, the plate; A, B, C, D, being the two raised

edges with the rivet holes. In this drawing the longitudinal edges are only delineated with raised edges and rivet holes, but when the boilers are of considerable

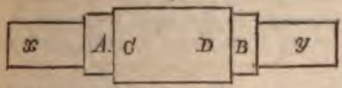
Fig. 2

Fig. 1



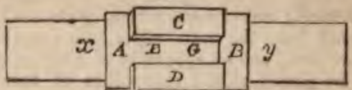
diameter, it would be necessary to raise the edges at the ends also, which is shown by fig. 2. It will very naturally be asked by persons not conversant with practical mechanics, "What use is it to give forms of machinery which are either impracticable in the arts, or at least not formed with sufficient facility to enable the artisan to compete with the known methods?" In answer I would say, that the boiler-plate with *two* raised edges can be rolled of that form with as great ease as without them, by simply cutting a small portion of the roller away at each end as shown by fig. 3.

Fig. 3



C, D, the highest part of the roller for forming the thinest part of the plate, and A, B, the further ends for raising the edges A, B, C, D, of the plate fig. 1. The ends *y*, and *x*, are the axes upon which the roller runs. When it is required to roll the plate of fig. 2, having raised edges all round; it becomes necessary to alter the roller a little, and it would also require a considerable deal more attention in the workmen in placing the metal under it; but of course like every other mechanical operation no difficulty would be experienced after a little practice. The roller is exhibited by fig. 4;

Fig. 4



C, D, the highest part of the roller for forming the central or thinest portion of the plate. A and B, the places cut down to raise the longitudinal edges A, B, C, D; and *x*, *y*, the axes on which the roller turns as shown before. The only difference between this figure and fig. 3, being in the part E, G, which is cut away until the bottom of it becomes level with the parts A and B. This groove is made for the purpose of raising the end edges of the plate A, C, B, D, fig. 2. It is obvious that the diameter of this roller must be a given quantity, so that the groove E, G, may form the two end edges at the required distance, and for that purpose the circumference of the roller, without the groove E, G, must be equal to the length of the *thin* part of the plate.

W. Ettrick.

Sunderland, Dec. 5, 1837.

WHISHAW'S HYDRAULIC TELEGRAPH.

Telegraphic communication by vision appears likely ere long to be superseded —if we may judge from the interest excited by the various rivals which have lately risen to the established mode. Electricity and sound have been for some time prominently on the tapis—both of them old ideas,—and now water is brought forward, and that not for the first time either,—as Mr. Vallance experimented upon it some twelve years ago. The following description of Mr. Whishaw's telegraph appeared in the *Times*:—

"A novel and ingenious method of conveying intelligence from one place to another has been lately invented by Mr. Francis Whishaw, of South-square, Gray's-inn, in which place there is now a model of the contrivance. The principle on which the process is carried on depends on the well-known fact of water always finding its own level (unless under circumstances where

operated upon by suction, &c.), or, in other words, of every part of a stream of water, when left to its natural tendency, continuing to be equi-distant from the centre of gravity. The invention is worked by the rising or depression of water, and is therefore appropriately called the "Hydraulic Telegraph." The detail of it is as follows:—It is proposed to place station-houses at various distances, from twenty to thirty, forty, or fifty miles apart, the distances to depend upon the nature of the ground to be traversed, as to its being a level or an unequal surface. From the termini of the line, to which the communications are to be made, and of course through the station-houses, leaden pipes are to be laid down at a distance of about five feet from the surface of the earth. In these pipes there is always to be a sufficient supply of water. At the termini, say London and Liverpool, and at each station, pipes are to extend from the main pipes into a proper apartment, and an apparatus of glass pipes to be placed at the extremities of them. These glass pipes will be perpendicular, and placed npon a table of figures, which figures, by means of a vocabulary or dictionary, are known to represent certain words, and are interpreted by reference to the dictionary, or to the knowledge of their signification, which will arise from memory or practice. By cocks fixed to the pipes at each station and at the termini, the water in the pipes can be heightened or lowered in such a manner as may be required to enable the water in the glass pipes to rise or fall, so as to bring the upper surface immediately opposite any figure on the table that may be necessary to represent the correspondent word or syllable or sentence in the dictionary. The water rising or falling in the glass pipe instantaneously, and by the principle of always finding its level, rising or falling at the pipes at the corresponding stations in a space of time incredibly rapid. By this means the communication is made from one station to another with the greatest accuracy and velocity, and with little danger of disarrangement. Another detail of the same principle, which is appended to the model of this contrivance now exhibited at the office of Mr. Whishaw, is the use of cylinders at the extremity of the pipes at the stations, in which cylinders are floats, to one of which floats, in one contrivance, an upright pi ce of wood is fixed, which operates upon a tranverse horizontal index, traversing a sextant table, on which the figures representing the words are marked; and on a float in another cylinder an upright index is placed, having a small horizontal piece of wire pointing to figures on an upright oblong table. *These last two methods* are elegant and ingenious, but do not perhaps, at least as far as can be discerned at a first and cursory inspection, materially improve the machine. The pipe of the model now in operation extends from a back room in the office of the inventor through a larger room, and into a third apartment. The pipe is about half an inch in diameter, a dimension said to be large enough for the actual plan, convoluted and twisted in many folds, in order to render the distance through the pipe as long as possible. At each end of it cocks to regulate the water, and upright glass pipes, such as have been described, with tables of figures, are affixed, in which the water mounts and falls by the regulation of the cocks, the surface pointing to the figures on the tables, as mercury or spirits of wine in a thermometer points to the scale of heat and cold. In the experiments which have been made, sentences of several words have been communicated with the greatest rapidity from one room to the other, and the interpretation, although the vocabulary of Mr. Whishaw at present has not above 12,000 words, has been perfect. The rough estimate of the expense of a telegraph of this sort, including stations aud contingent expenses, is 200*l.* a mile. The invention is exceedingly curious, though dependant on a well known and simple principle. It is well worthy a visit from all scientific persons, and from all who are interested in the rapid transmission of intelligence from places at great distances apart."

After the publication of the above description in the *Times*, a correspondent (W. Roberts) addressed a letter to that journal, claiming the invention for Mr. Vallance, who had published a pamphlet on the subject in 1825, but stating that the attempt to effect the end in view had been abandoned in consequence of its "perfect inutility in long lines." The objection he stated was, that the variations of temperature of the atmosphere would produce corresponding variations in the bulk of water in the pipes, and consequently irregularity in the working. To this letter Mr. Whishaw replied, that he was aware Mr. Vallance had written a pamphlet on the subject, but that he had never seen it; and continues—

"I believe, I may safely say, that neither he nor any other person ever got beyond a slight theoretical inquiry. Be this as it may, I can truly assert that I am indebted to no human being for the invention, nor is the subject new with me, telegraphs having occupied my attention for some years past, as my friends, not only in London but in other

England, can testify, and as the my diary will satisfactorily prove. to the point. Your correspondent t a column of water between London ningham (which distance, if he had read the accurate account of the ic Telegraph in the *Times* of Mon- he need not have taken as an illus- stations of from twenty to fifty miles ing there mentioned) would, by ex- be increased several feet in length. , that liquids expand, and particularly and that to a very considerable ex- lly experience proves; but, happily, is advancing with such rapidly in- strides, that difficulties which, a few go, were insurmountable or appa- , are now easily remedied. Water, panded by heat, and ranging from 0 degrees of Fahrenheit, is increased th part of its bulk.

this is a wide range, and such as uld take place with a short interval in practice; besides, the pipe is not xposed to the atmosphere, but laid tly below the surface of the earth, temperature of the stations can kept uniform throughout the year. even allowing the water to be slightly by heat and cold, the operation of it in the glasses or cylinders be- ch of the communications (which in ses do not occupy more than a few) comes to our aid, and the matter, reduced to a certainty.

rooms at present used as the two sta- of very different temperatures, the g exposed to the north and east and o fire, and the other to the south and having a large fire.

your correspondent urged the dif- of the density of the the atmosphere ent heights above the level of the even in the same places at different indicated by the barameter as an , it would have been apparently id; but this difficulty is to be sur- by a very simple yet ingenious con- of a friend, to describe which, how- uld extend this commuuication far the limits I had prescribed. In con- I beg to say that I have no inten- carrying on any further correspond- this subject through the medium of uable pages, (even should you per- but if any one hath aught to say ainst the hydraulic telegraph, let the trouble to see it in operation, stigate the matter practically."

Vallance also replied to Mr. Ro- He says—

eiving, many years ago, that tele- *communication was,* (as it still remains), in consequence of wet and foggy weather as well as darkness, available for barely one fourth of our time, it became a question with me whether this defect might not be remedied.

"On considering by what means to do so, it occurred to me, that as a column of water, when confined in a strong pipe, is, in point of effect, an inflexible though easily moved rod, it might be employed to push forward a hand, or index, even though that index were very remote from the source of motion. And as further consideration gave me to perceive, not only that the effects of any difference of level and of expansion and contraction might be obviated, but also that the index might be caused to come back again as certainly as it could be pushed forward, so as to 'telegraph' by its withdrawal as well as its advance, I saw that there existed a means of symbolic intercourse, which, I believed, required only what was done by the telegraph centuries (nay, millenia) after the first application of the principle, *i. e.* practical adoption, to make it available at all times, instead of only during daylight and clear weather.

"In consequence, I first proved the principle between places which were more hundreds of yards apart than Mr. Whishaw's two rooms are feet distant from each other; and then (in 1825) wrote and published the pamphlet mentioned in the letter of your yesterday's correspondent, Mr. Roberts, whose statement is not merely erroneous, but also injurious, because he hesitates not to pronounce, that 'the reason for its abandonment is its perfect inutility in long lines,' which is equally contrary to fact as it is false in principle."

Mr. Vallance continues, that the objection assigned by Mr. Roberts as the cause of failure,

"Has no more to do with the practical prevention of the plan, than the expansion of the Arctic ocean, by its change from winter's cold to summer's warmth, has to do with high water at London Bridge.

"Stating, in conclusion, that the experiments and investigations of above twenty years caused my belief on the subject to be so exactly opposed to that of Mr. Roberts, that I offered to the late Mr. Rothschild,—and, so far as relates to upholding the principle, now repeat that offer to the Government—to bring London and Paris so in communication, as for the overnight's news of each to be regularly known in the other every morning, excepting when prevented by stormy weather."

ACOUSTIC TELEGRAPH.

Nothing is more remarkable among the rage of inventions for communication than the neglect of signs by sound. A few years ago some experiments were made by Biot and Arago, in France, by which they ascertained that the sound by means of tubes could be propagated with almost infinite rapidity to any distance to which the tube extended. The experiments were made on tubes joined together to upwards of the length of a mile; and, so far as they could discover, if the tubes had been a thousand miles long, the sounds would have been articulated through them with the same immeasurable rapidity. This contrivance may yet be perfected, and we shall have communications passing through the bowels of continents as easily as they now pass from a tailor's counter to his shop-board in the attic. The speaking-trumpet is the only portable contrivance of the kind, but it is a remarkably rude and limited instrument. An attempt at improvement has been lately made in Austria. It is called an Acoustic Telegraph, and is a tube externally resembling a speaking-trumpet, but which is six feet five inches long, and carries the sound to about twelve thousand feet. It seems to be in high favour at Vienna, and it is said that orders have been given by the Government to supply many of the military stations with those instruments for manœuvring corps at a distance from each other. If this statement of its properties is exact, its use might produce a change in the whole system of war. The grand difficulty of tactics at present is to produce an *ensemble* in the movements of corps. The watch is not sufficient, for though troops may start from their points at a given time, yet the inequality of the road and other obstacles almost always produce a difference of movement. But an instrument which should communicate directly to a distance of two miles and a quarter in the sixth of a minute might keep up a constant notice of the movement. At present, in hilly and forest countries, the bugle is the only medium of communication; but it is limited to a narrow space, and capable of but few signals. Prodigious power would be given by an instrument capable of conveying not merely tones but words. We hope the ingenuity of some of our mechanics and philosophers will be turned to the subject.—*Blackwood's Magazine.*

EMBANKMENTS FROM THE SEA IN SCOTLAND.

There seems to be no operation connected *with agriculture* which promises more immediate and important results than the reclaiming of submerged lands in the estuaries of our large rivers. Till within these thirty years, the sole object contemplated in embanking submerged grounds, seems to have been the exclusion of water from the surface of soil which required only to be protected from its occasional invasions, and kept dry merely to make it eminently fit for most productive cultivation. Within the last twenty years, a system has been entered on, and is now, in the Forth and Tay in particular, being carried out to the most astonishing extent, not only of bringing into a cultivable state lands already, but for the periodical submergence, fit for cultivation, but of causing rivers to precipitate their mud in convenient localities, and so of creating fields where nothing before existed but a gravelly river bed, covered by from eight to twelve feet of water every tide, of the most unprecedented and unlooked for productiveness.

In the Forth, 350 acres of this sort of land have been, in the last twelve years, reclaimed by Lady Keith, at a cost of about 21,000*l*, and affording an annual return of about 1,400*l*., or nearly seven per cent. In the Tay, seventy acres have been recovered, opposite to the shores of Pitfour, 150 on those of Errol, and twenty around Mugdrum Island, making in all 240 acres, at about an outlay of 7,200*l*., yielding an annual rent of about 1,680*l*., or upwards of twenty-three per cent.! On the Errol estate alone, 400 acres are just about to be embanked, in addition to the above 150, all of which may probably be in cultivation before 1847. Off the shores of Seaside, a wall just now being built, 800 yards in length, will effect the recovery of not less than 150 acres; and on the Murie property, 50 acres might be taken in by seed-time 1838. The operations of the embanker, which began off Pitfour in 1826, will thus probably have been brought into cultivation before 1846, on a shore of not more than seven miles in length, no less than 810 acres of land, renting at from 6*l*. to 7*l*. per acre, or of a gross annual value of 5,670*l*., and a gross total value, at twenty-five years' purchase, of 141,750*l*. This is a clear creation of 117,450*l*. of clear agricultural capital, taking the reclaiming cost at 30*l*. an acre. The junction of Mugdrum Island to the north shore, would probably afford 1,000 acres at a single operation, while thrice that surface might be obtained betwixt Errol and Invergowrie.

The capabilities of the Forth, over and above what has already been effected above and below Kincardine, are not much, if at all, behind those of the Tay, though no sufficient enquiry has been made to permit details to be gone into.

basin of Montrose affords a surface
rly 3,000 acres, all capable of embank-
and which, by being relieved of the
ter of the ocean, which every tide at
t overflows them and keeps them sub-
l for twelve hours out of every twenty-
nd irrigated by the fertilizing current
Esk, which, for at least forty days
season, bears along with it not less
$\frac{1}{80}$th part of its weight of the richest
might speedily be made not less pro-
s than those of the Forth or Tay.
probable that between North Berwick
ontrose are to be found the most fa-
le localities for embanking on the east
of Scotland, if not indeed the only
hich could be made available with a
rospect of profit. It would be at the
ime well that the debouchures of all
at rivers were examined, lest at the
s of the Spey, the Dee, the Don, the
nd the Tweed, might lurk localities
r accessible to the embanker, and
r unlooked for or more than in the
Forth thirty years since.
e harbours on both sides of the Forth
mined, as low down as Dunbar on the
le, and Crail on the other; and those
Tay down to Broughty Ferry; those
Esk to Montrose and Ferryden, large
ties of silt will be found accumulating
h of them, quite as impalpable and
ad probably, if freed of salt, as fertile
se deposited and taken in higher up
ers. It is probable, then, that lands
be embanked much further out in
stuaries than seems at present to be
ted, by much the greater part of the
eous flocculi which the river bears
with it being actually carried out to

various embankments hitherto com-
have been constructed by those mani-
little acquainted with hydraulic engi-
, with little concert amongst the pro-
s, and without almost any recognition
eral principles or systematic plan of
ure. Many anomalies are conse-
y apparent in the now finished works,
ny cases of useless expense and an-
inconvenience have arisen, which it
have been most desirable and not dif-
o have avoided.
these and on many other grounds
must be apparent, but to enter into a
f. which would be much too tedious
present memoranda, it seems most
ant that something should be done in
y of a historical account of all the em-
g operations of any importance in
d, whether for the purpose of merely
ing lands previously existing, but
to *periodical inundations, from* tides or river freshes, or for the purpose of obtaining and inclosing accumulations of silt, which, but for the skill and industry of man, would have been wholly swept away.—*Journal of Agriculture.*

ADAMS'S EQUIROTAL CARRIAGES.

There are at present to be seen at Tattersall's some wheel carriages constructed on a principle which seems to us to possess great advantages over the wheel carriages now in use. They are called Patent Equirotal Carriages, and are suspended on regulating bow springs. The front wheels are as large as the hind ones. The springs are very flexible, and readily yield when the wheels are passing over obstacles. The two axles are capable of adjusting themselves by the traction of the carriage, either in parallel or radiating lines, with each other, according as the carriage advances, either on straight lines or curves; and thus the friction arising from the unequal tracking of ordinary carriages is avoided. In consequence of the frame work—technically called the "under carriage"—and, also, much of the iron work used in ordinary vehicles being dispensed with, and the springs reduced in weight one half, the total weight is materially lessened. When turning a corner, the weight is equally poised over the two axles, as when moving in a straight line. In ordinary carriages, the weight is frequently on three wheels, with the centre of gravity nearly over the base. In consequence of the power of radiation in both axles, sufficient friction may be obtained without injury to the carriage to arrest its motion down the steepest hill, or to stop it altogether on any slope without the aid of the cumbrous drag chain and shoe. The driver may by backing stop his horses on a hill slope as easily as on a level. Owing to the peculiar mode of locking, the driver's seat turns with the horses, and thus he is always square behind them when turning, with his full power exerted in a straight line, instead of losing his purchase by a sideway pull. The carriages may, if required, be so fitted up that all four wheels can, at the pleasure of the driver or sitters, be deprived of their free rolling movement, and converted into drags, in case of the horses running away. By the substitution of smooth turning centres, instead of the ordinary wheel plate and perch bolt, which rattle, and by the total absence of any other moving joints, such as spring bolts and shackles, and by the springs being each composed of a single plate of steel, they are very free from noise and concussion. They are also very easy to the sitters from the peculiar construction of the springs, which permit a universal ac-

tion both laterally and vertically, and also in a direction with the advancing motion of the carriage. And, by the flexible braces, the vibrating motion so frequently complained of, is entirely removed.

We have seen several of them, which are elegant in form, and we think they are likely to answer the expectations of the inventor, and be of advantage to the public. The principle on which they are constructed is applicable to railroad carriages as well as those on common roads; and by enabling the two axles to adjust themselves with each other, either in parallel or radiating lines, will allow railroads to be safely and conveniently constructed in curves of comparatively short diameter, as well as in straight lines. The principle on which this is done seems to be the total separation of the axle of the fore wheels from that of the hind ones, so that each part moves freely on its own centre, while the connection of the parts of the carriage is preserved independently of the perch or axletrees. Where the body of the coach admits of it, or when it is composed of two parts, each part may be said to have its separate pair of wheels, while the connection between the parts is established by a ball and socket-joint, which admits of free yet safe motion.—*Courier*.

THE SMOKE NUISANCE.

Perhaps the greatest gift of nature to England has been coal; yet one of the great drawbacks on this gift is its production of smoke. By this unfortunate property, England is blackened from end to end. Her cities are huge ovens, vaulted over with carbon; her villages taint the air with the stifling effluvia for miles round. Her many factories are perpetual volcanoes, without the picturesque of the volcano, and vomiting piles of smoke that might rival Vesuvius, at a daily expence that would purchase the fee-simple of the whole Campagna. As, in the course of a few years, London will stretch out its enormous arms to embrace Bristol on the one side and Edinburgh on the other, the land will evidently be covered with brick; a green field will be a matter of history, and view of the sky be talked of as among the reminiscences of old gentlemen who have lost their faculties. England will then be wrapped in a canopy of vapour from shore to shore; she will be the Auld Reekie of the globe. Even as matters are, this intolerable distillation defaces colours, and destroys all her public works. Her noblest architecture is begrimed in a week; Parian marble takes the colour of soot, her statues are as black as Erebus, and every new group of bronze instantly rivals that luckless group of Francis Duke of Bedford, with his agricultural genii round him, which stands for the ridicule of mankind in the front of Russell Square, and displays to the public eye the closest resemblance to a master-sweep surrounded by his apprentices.

And yet nothing is more unquestionable than that smoke is not the fault of the coal, but of our own indolence. We could destroy if we would, nay, we could convert it into heat, and thus at once increase the force of our fire and relieve our atmosphere from the darkness which defies the sun, and our lungs from a vapour which half chokes the community. A few years ago, Mr. Michael Angelo Taylor brought in a bill for the general improvement of the metropolis, amongst which was the extinction of the smoke. The smoke had the better of the battle, after all, and all the results of the bill dwindled into the whipping of unfortunate apple-women out of the streets by the policemen. The metropolis was darkened with double smoke, and now the lover of the sublime, who, standing on the Southwark Bridge, will cast his eye southward, may see a succession of gigantic cones shooting up smoke and flame round the horizon, as if they were the spiracles of a new region of subterranean fire. However, an attempt has lately been made to counteract this universal nuisance once more, and if we are to rely on the statements of the experimentalists, the object has been achieved.

The perfect combustion of any inflammable substance depends upon two circumstances,—the presence of a sufficient quantity of pure air to afford oxygen, and a degree of heat sufficiently high and steady to bring about the perfect union of all the inflammable particles with that oxygen. These two conditions are indispensably necessary, otherwise complete combustion cannot take place. In the great majority of instances there is no deficiency in the supply of oxygen, but in almost every case the proper quantity of heat is wanting. Now, the manner in which this acts in producing smoke is the following: We shall take the case of a common furnace by way of example:—If we examine the fire, we see no smoke in the fire itself, because the temperature there is sufficiently elevated; but at the point of the flame, where the yet unconsumed carbonaceous matter comes in contact with the cold atmospheric air, the smoke makes its appearance, because the temperature is there reduced below that point at which perfect combustion takes place; and the consequence is, that there is a deposition of carbon, and the heating power of the fire is just so much lower than it ought to be, by the number of degrees of heat the

smoke would have yielded had it been consumed. In other words, the smoke is a certain quantity of the inflammable matter of the coals which is lost by evaporation, instead of being burned.—*Blackwood's Mag.*

METEORIC SHOWERS OF NOVEMBER.

In our last number we gave accounts of this brilliant periodical phenomenon, as it appeared in America, &c.; we now add the particulars of what has been observed elsewhere.

At Paisley, at Manchester, at Aylesbury, at Cambridge, at Birmingham, and at Paris, (says the *Morning Advertiser*) on the anticipated 12th of November (namely Sunday evening), the aurora borealis was simultaneously observed from seven to eight o'clock, characterised by extraordinary brilliancy and vivid beauty. This meteoric phenomenon was again observed on November the 16th, the last day which limits the interval. viz.—Wednesday night between six and seven o'clock. The manifestation was accompanied with still more brilliancy than the former. To persons entering London about that time, it presented an appearance of an alarming conflagration; and in fact, the fire-engines of two companies were set in motion by the indication, and were traversing London in all directions under the persuasion that a fire of great extent had broken out within its precincts. As far as our knowledge is limited to the various districts, from whence our reports have come, the phenomenon this year has not been observed to have been associated with its usual accompaniment of a shower of falling stars. Some few were seen at Paisley and at Aylesbury; we ourselves witnessed two at the time of the aurora borealis. At Sherborne, on Sunday evening, the zodiacal lights appeared like an "immense mass of beautifully strated crimson vapour, stretching from the northern horizon to an amazing height, gradually expanding, and occasionally intermingling with feather-like branches of silvery coruscations, which at times formed a rich and variegated canopy, covering the entire expanse from the north to the southern hemisphere." At Glasgow a magnificent meteor was observed from the observatory at a quarter past eight, on the evening of November the 11th. It shot on a splendid globe of white flame from beyond the Great Bear, in the direction of the Lyre, and did not disappear until it had considerably passed the latter constellation. It exhibited a remarkable feature when near the star Vego. Its path had previously been almost rectilineal, or very slightly curved; but at the moment referred to it burst into an undulating figure not dissimilar to the letter S placed on its side and afterwards continued, as nearly as the eye could judge, the line of its former course.

From Paris we have the following account extracted from the *Constitutionnel* of Friday, November 18th. For some time past the aurora borealis glows with increasing splendour over our Parisian horizon. To those which distinguished the evenings of the 12th and 13th, may be added the splendid meteor which exhibited itself at eleven o'clock on the 14th. Broad bands of blood-coloured and coruscating light, which darted incessantly towards the zenith, exhibited to the observer a sublimely beautiful spectacle. This prodigious profusion of the zodiacal light, is a curious coincidence at this periodical return of the phenomenon of falling stars. This year, therefore, presents some novelty in the report; at all events, the exhibition of all the accesories of the phenomenon does not appear to be invariable. It will be found, however, on looking to the history of its periodical appearance, phenomena of a magnetic or electrical description have been more regularly seen in this country than the more striking phenomena of the shower of falling stars. Supporting himself on this fact, the celebrated astronomer, M. Biot has brought forwurd a theory respecting these periodical meteors, which in concurrence with the scientific excitement caused by the phenomenon, and with the universal preparation of scientific men for its observation, he read previous to the commencement of the present month, before the *Academie des Sciences*. This paper (published in one of the recent French journals) is most able and most elaborate. We have no space for the entire translation, and therefore we must limit ourselves to a substantial detail of its drift and inference. M. Biot's theory is in perfect concurrence with the atmospheric phenomena of the zodiacal lights recently observed, and to which we began by adverting. His opinion is, that the result is produced in consequence of the earth, on reaching a particular point of its course on the 12th of November), coming in contact with that solar nebulosity to which the aurora borealis is by the majority of astronomers attributed. He says, "That on the 13th of November the earth arrives very near to the ascending node of the nebulosity, towards which she is approaching, and towards which she will soon travel; that she must operate by her attraction and by her collision on the material particles of the nebulosity, which will be at the same epoch near the ascending nodes of their orbits, and at similar distances from the sun as the earth, or very little different; from which would result

phenomena that would be coincident, as to direction and time, with those that the periodical phenomena of November have presented. Finally, the usual and much more central passage of Mercury and Venus through the region of the nebulosity, must disperse innumerable multitudes of its particles into orbits slightly inclined to the ecliptic, and in every direction, so that the earth may accidentally meet with them again in other points of its course." These particles, travelling in one and the same direction, are the asteriods or falling stars which we periodically encounter. It must be remembered that it was only in 1831 that attention was first called to the asteroids, but since then the synchronism of their appearance, both as to date and locality, has been accurately ascertained. On the 11th and 13th of November of that year Captain Bernard, when off the coast of Carthagena in South America, observed a shower of falling stars, which, during three hours, he calculated to be at the rate of two stars per minute, and precisely at the same time Dr. Wright obserued a similar shower in the province of Ohio, in the United States. In 1832, on the 13th of November, a shower of shooting stars was observed at Orenburg, in Asiatic Russia, between three and four o'clock in the afternoon. They were in large and contincus numbers, and traversed the horizon in a regular current, from north-east to south-west. In 1834 numerous showers of shooting stars were seen in most of the states of North America, where the circumstance caused great excitement, and was recorded in the principal journals. It was as usual, on the nights of the 12th and 13th of November. In 1835 these appearances in America were resumed at the same date; and on the night of the 13th and 14th of the same year M. Delzeune observed at Lisle an igneous meteor, like a star, larger and more brilliant than Jupiter, and which left behind its track on its disappearance, a shower of smaller stars. In 1836, at the usual period, in the month of November, simultaneous observations were made of showers of falling stars in a great number of the provincial districts of France. In Paris, at six o'clock in the evening of the 12th, the celebrated astronomer, M. Arago, observed one hundred and ninety of these stars, the track of which were principally confined to the constellation Leo. At Bercy at the same M. Meret saw one hundred and twenty of these stars, half of which proceeded from the same constellation. At Strasburg at the same time eighty-five were seen by Professor Fangean, out of which fifty-seven were visibly in the direction of Leo; at Angiers, forty-nine were seen by Professor Moren; at Rochfort, twenty-three, by Lieutenant Salneuve; and at La Chapelle, thirty-six were observed within the space of three hours and three quarters, by Messrs. Calais and Racine. Contemporaneous with these observations in France, sixty of the same falling stars were seen at Plymouth in the same special interval of their periodical return—viz., on the 11th and 15th of November. On reverting to more remote periods than 1831, when Captain Bernard and Dr. Wright saw showers of falling stars in different parts of the transatlantic continent, we find a remarkable periodical occurrence of luminous phenomena, at precisely the same period—viz., from the 12th to the 16th of November, during a long course of years. There are authentic records of the following meteorological appearance as early as 13th Nov. 1634, when a large ball of fire with along tail of igneous particles was observed in Bohemia. On the 12th of November, 1760, a large fire ball exploded with a loud detonation near Dijon, in France, and set fire to a house there. On the 12th of November, 1791, about half-past six in the evening, a large and brilliant meteor, which burst into a shower of stars like a rocket, was observed at Gottingen, by Professor Lictenburg. On the 13th of November, 1803, a remarkable meteor, called in the papers a "fire ball," passed over a considerable track in England, and was observed by several persons at the same time in different situations. In 1813, on 10th of November, between six and seven o'clock in the evening, England was again visited by a brilliant and detonating meteor of considerable magnitude. In November, 1819, a meteoric globe of fire was seen nearly at the same time in Hayti, in Bohemia, and in England. On the 14th of November, 1825, a large meteoric fire ball exploded in Scotland. It was after this date that attention was first drawn to the periodical appearance of showers of falling stars in differ- parts of the world. From the foregoing details, to which a vast series of meteorological coincidences might be added(if we had space or leisure), it appears that there are some distinctions in the manafestations of these phenomena, and that the asteroids of the 12th and 13th of November are only visible when they penetrate the atmosphere of the earth. Sometimes they appear in a numerous, and sometimes in a more limited form. But there is the best reason for inferring, from the observations which have been made in current month, that M. Biot's theory is based upon correct data and inferences, and that the phenomena of the solitary igneous meteors, and the showers of stars, being synchronical, are connected with, and depending upon, the more familiar phenomenon

of the zodiacal lights. Some times these globular meteors appear alone and in considerable volume. The most brilliant of them, in 1836, shed a lustre equal to the planet of Venus. Sometimes they appear to burst and diffuse a train of sparks, which are visible for several seconds. According to the opinion of Professor Milet, these asteriods occasionally fall upon the earth like aerolites, or thunder-stones. He affirms that he saw several of these meteors fall and visibly strike the slope of a range of mountains surrounding the locality from which he made the observation. The fact furnishes a new and curious example in addition to others of the coincidence of ancient traditions, gegeneraly referred to the inventions of superstition, with the results of modern scientific discovery. The ancient tradition of falling stars, as the classical reader need not be reminded, constituted one of the primary elements of the most ancient Pagan creeds. The disappearance of an *eighth pleiade*, asserted by the mythologists, and coupled with some idea of a fall, may, in fact, have been the result of some astronomical observations; since it is certain that some stars have not only been extinguished, but broken up by some planetary collision into fragments which have still preserved their rotary action throughout space. Asteria, the Goddess of Justice (an impersonation of the same eighth star), was reported to have withdrawn herself from the sight of the earth with the golden age. Again, Astarte, the Syrian Venus, was classically recorded to have fallen from heaven in the shape of a star upon Mount Lebanon, where a temple was raised to her worship, and on the very spot where the apocryphal book of Enoch assembles those Egregori, or fallen angels, who are described in that book as fallen stars, and whose unearthly love for the daughters of men has been so sublimely pictured by Byron and Moore. According to M. Milet, stars, or fragments of stars, as in confirmation of those old traditions, do really fall to the earth, and thus the vulger superstition of ancient prejudice as well as of modern ignorance, which have been ridiculed for pronouncing these vagrant meteors to be *falling stars*, turns out to be philosophically correct.—*Advertiser*.

COMPARATIVE VALUE OF RAW AND MANUFACTURED FLAX.

Last season, the finest flax in Flanders was sold as high as about 90*l*. a ton, and the future progress of this flax is singular. A great part of it is exported to Britain, where it is spun by machinery into threads of extraordinary fineness. A considerable portion of it is returned from Britan to Flanders, or sent to France, where it is used for making the finest lace; and the ton of flax, which costs our manufacturer 90*l*. is perhaps, within a few miles of the place of its gtowth, sold by him in its manufactured state, at a price, as I was informed, generally exceeding 2000*l*. a ton! As no mills can dress flax so fine as the hand, so no hands have yet been found which can spin threads so equal and so fine as our improved machinery, and yet great as is the additional value of the spun thread above the flax, a yet greater addition is made, when these threads are wrought into lace; thus beautifully in the economy of Providence is one substance, in that, as in thousands of instances besides, made to furnish employment and comfort to various classes of human beings, far removed from each other, during the various steps of its progress, from the raw material to the finished manufacture—*Quarterly Journal of Agriculture*.

FOREIGN RAILWAYS.

AUSTRIAN.—The railroad near Vienna, called *Kaiser Ferdinand's Nordbahn*, or the Emperor Ferdinand's North-way, was partially opened on the 23d of November, from Florisdorf to Wagram, a distance of one German mile and three quarters, or about eight English miles. An immense crowd, including all the fashionable world of Vienna, assembled to witness the novel and interesting spectacle. A train of eight passenger-carriages was formed, some conveying eighteen, and others twenty-four, the whole train one hundred and fifty individuals, and attached to a locomotive machine of thirty-horse power. The locomotive, which was ordered from England, arrived at Vienna some months ago, and has since been a great object of curiosity to all the engineers and mechanicians of the capital, who express the most unbounded admiration of its construction. The passenger-carriages were, we believe, of native make, and are highly praised for their luxurious elegance. At ten o'clock precisely, the whole train moved off, to the enthusiastic delight of the spectators, and safely arrived at Wagram in twenty-six minutes, where it was turned round, and guided back to Florisdorf. The whole affair went off to the satisfaction of all parties. It is anticipated that early in December the line will be practicable as far as the Prater itself, the gigantic bridge over the great branch of the Danube being now nearly completed.

DUTCH.—A pamphlet, by Mr. Donker Curtis, in favour of the extension of railways in Holland, has met with an opponent in the person of Mr. A. F. Bouricius, "Royal Prussian Titular Postmaster at Arnheim." Mr. Bouricius, in his pamphlet on the subject, even declares himself opposed to the railway already begun between Amsterdam and Haarlem, observing, that "in commerce Amsterdam is now no more a Liverpool than Haarlem is a Manchester." He considers that injury will be done to the capital already embarked in canals, treckschuyts, &c., and no counterbalancing advantages obtained by a mere increase in the speed of internal communications, the probable profits of which in Holland, he regards as totally inadequate to reimburse its promoters. We can only observe that the circumstances of Holland, with regard to canals, are certainly so peculiar, as to render the new improvement of less convenience to them than to any other state; but it would be a most singular spectacle, if, while almost all Europe is eagerly pressing forward to reap the advantages of this great discovery, and the thinly-peopled States of America, one of its richest, most industrious, most commercial, and most thickly-peopled communities were to remain active.

FRENCH.—Operations are carrying on with activity on the railroad from Montpellier to Cette. The road through the morasses of Vic and Frontignan, is already marked out, and that through the piece of water called "the Pond of Ingril," begun. The works are under the direction of an English engineer, Mr. Thomas Brunton. A railroad is projected from Montpellier to Nismes.

ITALIAN.—The works are begun on the railroad from Naples to Castellamare. The shares of this undertaking are 1,000 Italian *lire* each, or about 40*l*. sterling, each *lire* being equal to a French franc, or nearly ten pence English. The whole capital comprises eleven thousand of these shares, or eleven million of *lire*, about 440,000*l*. There is a great difference of opinion at Naples as to whether the undertaking will ever pay; but, we believe, little difference of opinion any where else.

PRUSSIAN.—The Royal permission, or "concession," as it is technically called, for the formation of a railway from Magdeburgh to Leipzig, was received at Magdeburgh on the 24th of November, together with the law of expropriation, or permission to take possession of private landed property for the purposes of the railway, on the payment of an adequate compensation awarded to the proprietors, in the same manner as in the *use of high-roads* made by Government. This permission is clogged with conditions, liberty to take possession of the whole concern, paying a compensation to the then existing shareholders; a measure which, of course, is certain to be adopted in case the undertaking should prove successful. Another is, that at the expiration of ninety years, the railway becomes unconditionally the property of the State. The new railroad is to pass through Kothen and Halle to Leipzig, where, by the time it is completed, it will find that from Leipzig to Dresden in full operation.—*Railway Times.*

ON THE LUMINOUS PROPERTIES OF CHLORIDE OF CALCIUM, BY CHARLES TOMLINSON, ESQ.

(From Sturgeon's Annals of Electricity.)

When chloride of lime is subjected to a red heat in a Hessian crucible, it undergoes the watery fusion and is gradually decomposed. Chlorine is at first evolved, then oxygen; and chloride of calcium remains in the crucible. This substance, when thus treated, emits a pale green phosphorescent light, visible in the dark, and was formerly called on this account, *Phosphorus of Homberg*, this chemist being the first to record the fact.

But when the chloride of lime is completely melted in its water of crystallization, if the crudible be removed to a darkened room and allowed to cool gradually, not only does the phosphorescent light remain for many minutes, but large and distinct electric sparks and coruscations are visible, accompanied by a crackling noise, due probably to the sudden contraction of the mass, or to its crystallization.

These phenomena can also be seen in the dark by dipping a glass rod into the fluid, a large portion of which concretes around it, and can be withdrawn with the rod.

When the contents of the crudible have cooled down, and all phosphorescence has disappeared, the sparks can be obtained most admirably by striking the chloride with a sharp instrument of any material; by simply scratching it; or by snapping a piece asunder; or by percussion with a hammer; and both sparks and phosphorescence can be obtained by grinding the substance in a mortar, and the luminous effects remain for a few seconds after the grinding is discontinued.

The colour and intensity of the sparks thus produced seem to vary with the degree of mechanical force employed; thus, a gentle scratch produces green sparks; a firm scratch, yellow green; a blow with a sharp instru-

ment, yellow; snapping a piece asunder also one of which is, that after the expiration of thirty years, the Government is to be at affords a yellow spark, and a smart blow with a hammer affords a spark of an orange colour.

All these effects are best seen with the newly fused chloride; it absorbs water by exposure to the air and its electrical properties gradually decline; I have, however, obtained the sparks from it after a few days' exposure, but they were wanting in the brilliancy which characterize those obtained from the substance when newly fused.

The term *phosphorescence* seems to be a very bad one and calculated to mislead; since it is highly probable that all recorded instances of phosphorescent minerals, &c. (except, of course, phosphorus, itself and its compounds) are due to electricity. It has been shown by Dessaignes that metallic bodies are capable of electric excitation by the simple processes of treating and cooling. Morgan has shown that there is no fluid nor solid but may be rendered luminous by the transmission of an electrical discharge through its substance; and that the difficulty of producing this appearance in all bodies increases as the conducting power of the body decreases. Skrimshire has given a long list of minerals, in which calcarious bodies occupy a conspicuous part, which become phosphorescent by the electrical discharge; and Brewster also has a long list of mineral substances which become phosphorescent by heat. Now the appearance of the hot chloride of calcium is similar to that of white sugar, immediately after an electrical discharge has been transmitted through it. All calcarious substances present this appearance in a high degree when similarly treated, and the exciting cause is probably the same; for whether we employ the electrical battery or the hot crudible, heat is communicated to the substance, and heat is favourable to electrical excitation. A piece of lump sugar, mica, &c. when suddenly snapped asunder, and cotton cloth when suddenly torn, show the electric spark; so also does the fracture of the chloride of calcium. An enquiry, therefore, seems to be wanting into the connexion between phosphorescence and electricity since it is manifest that the appearances attending the slow combustion of phosphorus, and the light emitted by certain minerals when heated, &c, though similar in appearance are due to very different causes.

Salisbury, March 4, 1837.

DESCRIPTION AND USE OF AN ELECTRO-MAGNETIC BALANCE, AND OF A PILE FOR CONSTANT CURRENTS. BY M. BECQUEREL.

(From Sturgeon's Annals of Electricity.)

Until now we have possessed only two means of comparing currents with one another in regard to their intensity: the one is by making a magnetic needle oscillate for a given time, at a certain distance from a wire conductor, traversed by currents not having the same energy, and then calculating the intensity of each of them by means of the formula of the pendulum; the other requires the employment of the multiplier.

By neither of these methods can we reduce the intensities of one current to an easily attainable common measure, an object which should be always kept in view whilst studying the action of forces.

I have endeavoured to compare the electro-magnetic effects of a current by means of weights. The apparatus used for this comparison was arranged as follows:—Take a balance capable of weighing to the fraction of a milligramme; to each of the extremities of the beam suspended from a vertical stem, a scale pan, and a magnet whose north pole is situated in the lower end; afterwards place beneath, on a conveniently situated apparatus, two glass tubes of a sufficient diameter to allow the two bars to enter easily without touching the sides. About each of these tubes is twisted a copper wire covered with silk, so as to form ten thousand circumvolutions. After having placed the bars in the axis of the spirals, make an electric current traverse the wire. Considering first a single spiral, it is very evident that the magnetized bar, as well as the beam with which it is in connection, will be raised or lowered according to the direction of the current. Let us now disp oseof the second spiral, so that the motion of the beam shall be in the same direction when the wire is traversed by the current, and then connect the two spirals; the action that they exercise on the bars will necessarily be increased. Some examples will give an idea of the use of this apparatus. Having taken two plates—one of zinc, and the other of copper—presenting each a surface of four centimeters square, and in communication with the two spirals, immersing them at the same time in ten grammes of distilled water, one of the scale pans was weighed down, and it was necessary to add to the other a weight of 2·5 milligrammes to main-

* From the "Comptes rendus hebdomadaires des Seances, de l'Academie Royale des Sciences," for 1837, No. 2; being an epitome of a paper read before the Academy, 9th January.—Translated by Mr. J. H. Lang.

tain the equilibrium; the magnetic needle of of a multiplier, with a short wire, which had been placed in the circuit, was deviated to 60°. By adding to the liquid a drop of sulphuric acid, it was necessary to employ 35·5 milligrammes to maintaim the equilibrium: the two currents were then in the proportion of about 1 to 14.

I afterwards sought the relation by weights between currents proceeding from piles composed of more or less numerous elements; with a pile of 40, charged with water containing $\frac{1}{80}$ sulphuric acid, $\frac{1}{20}$ marine salt, and some drops of nitric acid, I was obliged to take 615 milligrammes to maintain the equilibrium; whence it follows that the intensity of this current is to that obtained by a single pair as $17\frac{1}{3}$ to 1.

For measuring thermo-electric currents I made use of spirals like the former, except that they were formed with two series of circumvolutions. I applied it to the determination of the temperatures of the different strata of the flame of an alcohol lamp, by means of two platina wires, not having the same diameter, and united by one of their ends. These temperatures have been found equal to 1310°· 98; 913°· 24; 743°· 50.

The examples given in may memoir prove with what facility electrical currents of different degrees of tension, may be compared with each other by means of weights.

When we wish to measure the continued action of a force, we must first seek the means of giving it a constant intensity. But the electric current produced by the common piles, and even by a single pair is subject to such continual variations that it is impossible to submit its mode of action to calculation. It is to avoid this inconvenience that we have constructed a pile which excites a current whose intensity does not sensibly vary for 24, and sometimes even for 48 hours.

I published an account some years ago, of an apparatus having the property of producing a current which displays but little variation during the time specified. It was formed of two small glass vessels, one of which contained concentrated nitric acid, and the other a solution of caustic potash, also concentrated. The two vessels communicated with each other by means of a bent glass tube, filled with very fine clay, moistened with a solution of marine salt. In the vessel which contains the alkali immerse a plate of gold, and in the other a plate of platinum. By connecting these two plates with a multiplier, a tolerably energetic current may be perceived, resulting from the reaction of the acid on the sea salt and potash. The gold plate takes negative electricity to the alkali, and the platinum positive to the acid.

To obtain the maximum effect, we must pay attention to the following considerations in the construction of this apparatus. If it were possible to convert into a current, all the electricity which is disengaged by the combination of a given quantity of acid with a proportionate quantity of alkali, this current would, in its turn, be capable of decomposing all the salt formed. Hence, if in the reaction of an acid with an alkali we can secure a sufficiently strong part of the disengaged electricities, we may have a current of an intensity capable of effecting decompositions. To fulfil in part this condition, we take two platina tubes, each bent at one of its ends to enable it to enter into a tube of glass. One of the platina tubes is filled with clay, moistened with nitric acid; the other with clay moistened with a solution of potassa, and the intermediate tube with clay moistened with a solution of sea-salt. The lower extremities of the platina tubes are closed by lids of the same metal, pierced with many small openings. The end of the tube which is filled with the acid-mostened clay is immersed in some nitric acid, and the other in a solution of potassa. To facilitate the transmission of the electricity through the clay to the sides of the tube, a little powdered platinum is mixed with it to increase its conductibility.

Things being thus arranged, to the extremities of the bent branches platina wires are fixed, for the purpose of transmitting the current through those bodies on which we are operating. By uniting several of these apparatus we have a pile whose effects are constant.

One of these pairs alone has required 8·5 milligrammes to maintain the equilibrium. At the same time a short wired galvanometer placed in the circuit gave a deviation of 79 degrees. I have shown in my memoir that the effects of this pile do not sensibly vary for a considerable time. It is easy to account for this permanency in its effects. We know that the decomposing metallic plates forming part of a voltaic circuit, and immersed in a solution, become polarized, so as to impel a current in a direction opposite to the first: the polarization of each of these plates arises from the deposition of a substance transferred to its surface by the current, and whose nature depends on the position of this plate with regard to the extremities of the pile. While this substance remains in contact with the plate, there will be a current in a direction contrary to the primitive; but if the substance be surrounded by a liquid which has a strong affinity for it, it combines with it, and the plate is immediately depolarized. This is precisely what takes place in the different elements of the

have described: the alkali which is ed to the negative plate combines :ely with the surrounding acid, and ›sited on the positive plate is neu- ›y the acid which surrounds it.

› entered into some details on the hemical effects of polarization of the sing plates, when they transmit uni- rents produced by an apparatus com- : 1, 2, 3, or 4 pairs. I afterwards the result of my first experiments apparatus already described, for the of establishing the relations which the affinities with the electric forces. e discoveries of M. Faraday on the nature and extension of electro- . decomposition, we know that the . power of a current is in direct pro- :o the absolute quantity of electricity asses. It is by depending upon this › that he has determined the equi- of bodies; but in his researches he noticed the absolute intensity of the ich acts at each instant: it is this : I have tried to fill up by means of ratus. It has been remarked for a e that the elements which are com- th the most energy are those which mposed with the greatest facility by ent, and those which are combined e of the weakest affinities are also ich are least obedient to the decom- ction of the electricity in motion; ich it seems to result, that all com- odies are decomposed by the in- of a current, in proportion to the the affinity which unites their ele- If, then, we could establish a rela- :ween the intensity of the current, affinity, we should have a means of ng the latter. In researches of this ention should be paid to the follow- :rvations of M. Faraday:—1st, that tric powers, like the chemical action electricity are definite; 2d, that a able quantity of electricity in the a current decomposes only a few ›; 3d, that the electric agent is only d to overcome the electro-chemical —whence it follows that the quantity asses, is at least equal to that which ticles possess when separated; 4th, re exists a perfect concord between ›ry of definite proportions and that ro-chemical affinity: whence it re- at we may consider the equivalent : bodies as volumes which contain uantities of electricity, or at least ave equal electric powers. The atoms :s which are equivalent to each other *ordinary chemical action*, have, there- *al quantities of electricity* combined 1. *The following* are the first experiments I made for the solution of the question I had proposed.

When an invariable current is passed through two solutions, at different degrees of saturation, of a salt with a reducible base, the quantity of salt decomposed is precisely the same in both. I took 2·8 grammes of dry nitrate of copper, which was dissolved in 10·3 grammes of water: half the solution was increased by its volume of water; the two copper wires which were immersed in the two negative branches weighed 0·3385 grammes. After 48 hours' experiment these wires weighed 0·36 grammes: they had gained consequently 0·215 grammes. The intensity of the current which produced this effect was represented by 5 milligrammes.

The intensity being diminished by one-half, the quantity of copper reduced in 48 hours was equal to 0·01 grammes, that is to say, half of that obtained in the preceeding experiment.

I submitted the same wire, and the same solutions for 48 hours to the action of a current, counterbalancing 3 milligrammes; I obtained 0·012 milligrammes of copper; if, now, the quantities of copper reduced in the two experiments be compared, they will be found exactly proportional to the intensities of the current. Various experiments of the same kind have been made on solutions of nitrate of silver, varying the density of the solution, and the intensity of the current. The quantities of metal reduced were exactly proportional to the variation of the current, the source remaining constant, this being an indispensable condition.

These results follow from the observations of M. Faraday; but there is this difference between his and mine—viz. That he has not noticed the absolute intensity of the current, whilst I have taken account of it, and we shall see in another memoir the advantages to be derived from the introduction of this new element in experiments on electro-chemical researches.

I have tried, by means of the electro-magnetic balance, when solutions of different metals were submitted to the action of the same current of known intensity, what relation existed between the quantities of metal reduced; three solutions, one of copper, one of silver, and one of zinc were introduced into the circuit. These solutions were in U tubes, and each of them on the negative side was in contact with a plate of platinum, and on the positive with a plate of the same metal as that in solution; they were submitted to the action of an apparatus of two pairs prepared with platina cylinders. The following are the results:—

The intensity of the current counterbalanced a weight of 5·5 milligrammes.

After 24 hours' experiment, the silver precipitated weighed 0·305 milligrammes; the weight of the copper precipitated 0·090 milligrammes; that of the zinc precipitated 0·0925 milligrammes. If now we examine the proportion of the three quantities of metal precipitated, we shall find that they are proportional to the atomic weights of silver, copper, and zinc; for if we consider the two first, we have 305 : 90 :: 108 (the atomic weight of the silver) to 31·8, instead of 31·6, the atomic weight of the copper. Likewise 305 : 92·5 :: 108, (the atomic weight of the silver) to 32·8 (the atomic weight of the zinc), instead of 32·5, as found by M. Faraday. Hence we see that an apparatus with a constant current, composed only of two pairs, with the electro-magnetic balance, enables us to find the atomic weights of metals, and to determine the quantities of metal reduced, corresponding to a given intensity of current.

LIST OF IRISH PATENTS GRANTED IN NOVEMBER 1837.

Miles Berry, of Chancery-lane, Middlesex, for improvements in cleansing, purifying, and drying wheat, and other grains and seeds.

Henry Stephens, of Charlotte-street, Marylebone, and Ebenezer Nash, of Buross-street, St. George's in the East, tallow-chandler, for certain improvements in manufacturing colouring matter, and rendering certain colours applicable to dyeing, staining, and writing.

John Gotleib Hartly, of No. 11, Beaumont-row, Mile-end-road, for improvements in applying of levers for multiplying power.

William Henry Goshen, of Crosby-square, Bishopgate, London, for improvements in preparing flax and hemp for spinning.

John Paul Newmann, of Great Tower-street, London, for improvements in the manufacturing of prussiate of potash and prussiate of soda.

NOTES AND NOTICES.

A Splendid Staircase.—The city of Odessa on the Black Sea, is situated considerably above the level of the water. The Russian government have just determined on the construction of a spendid staircase, to connect the city and the harbour. It will consist of 200 steps, in somewhat of a pyramidical form, for the lower steps are to have a breadth of 350 feet, while the upper ones are only to be 175 feet broad. The colossal staircase, which is to be of white marble, will be supported by thirty-six columns.

House Painting.—A very simple method has lately been adopted to render the surface of paint perfectly smooth, and eradicate the brush marks. It is done by a small roller covered with cloth or felt, about eight inches long and two inches in diameter, worked in pivots, similar to the commo
roller. The flatting coat, by this method,
beautifully even, and looks exceeding well.

Employment for Females.—There are
the mechanical arts, at present exclusive
tised by men, for which women of the
classes would be found fit. There is nothi
ever in the art of the compositor, the
maker, the type-founder, and many others
woman would be unable to accomplish.
greater nicety and minute skill would ev
lify them above the generality of men f
employments. A further variety of emp
might be placed within their choice by th
sion of the millinery art. Many new k
needle-work might be invented, for which
qualified persons might be found. Tam
was all at once added a few years ago to
and instantly brought numberless fresh fin
activity. The fine flowered sewing, called
work, has likewise been created within the
years, and now yields subsistence to many
in various districts of Scotland, who form
the bitter bread of dependence, or the stint
of unavoidable idleness,—*Chambers' Journ*

To Take Impressions from Leaves.—Tak
leaves of trees and flowers, and lay them
the leaves of a book till they are dry. T
some lamp-black with drying oil, and make
dabber of some cotton wrapped up in a
soft leather. Lay the dried leaf flat upon
and dab it *very gently* with the mixture
veins of the leaf are covered! being carefu
dab it so hard as to force the colour betw
veins. Moisten a piece of paper, or what i
lay a piece of paper, between some sheets
tened paper for several hours, and lay this
leaf which has been blackened with the
press it gently down, and then lay a heavy
upon it and press it down very hard. By thi
you obtain a very beautiful impression o
with all its veins: even the minutest will b
sented in a more perfect manner than th
be drawn with the greatest care. Impressi
taken may also be coloured in the same m
prints.

British Enterprise Abroad.—The traces o
capital are to be met with everywhere abroa
of the cities of Europe which enjoy the " ne
of the nineteenth century are furnished wi
"The British Continental Gas-Associatio
Paris itself is about to be supplied with
the English plan, by a Company of which th
are in a great measure held by Englishn
"Sardinian Mining Company" has recent
established, for the purpose of working a nu
mines in the Savoy, which are said to be
ingly rich, and to offer very peculiar adv
The proprietors are English, and they pr
smelt the ore by a new English process. T
of the mines, of silver, copper, and iron,
Duchy of Nassau, have been leased to an
association, who expect to reap important
tages from the application of a greater d
skill and capital to the works than has ever
been bestowed upon them. It is said that t
number of mines in the possession of this C
is upwards of two hundred and eighty!

Supplement to Vol. xxvii, containing title
contents, lists of patents, and portrait of
M. D., F. R. S., &c., is published, price 6
the volume in cloth, price 8*s*.

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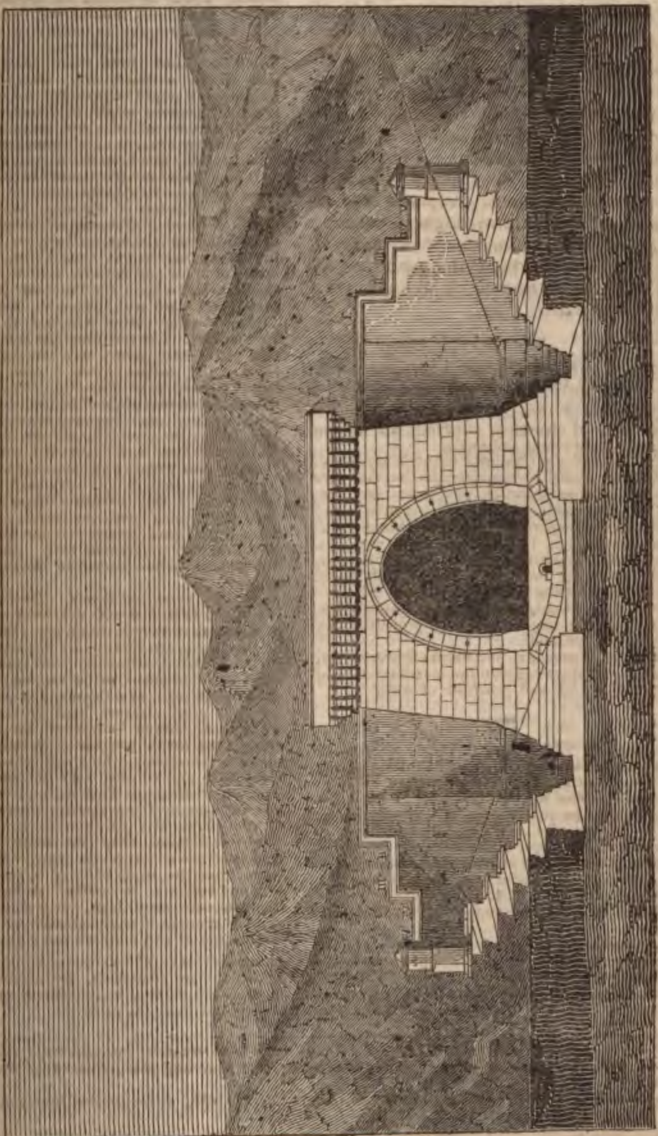
Mechanics' Magazine,

MUSEUM, REGISTER, JOURNAL, AND GAZETTE

No. 751.] SATURDAY, DECEMBER 30, 1837. [Price 3*d*.



THE KILSBY TUNNEL—BIRMINGHAM RAILWAY.

THE KILSBY TUNNEL—BIRMINGHAM RAILWAY.*

(Communicated by C. Davy, Esq., Architect.)

The prosecution of this public work has been attended with many unforeseen and unexpected difficulties and delays. These have arisen from a variety of circumstances which it was impossible either to calculate upon or foresee.

Kilsby (the village from which the tunnel derives it name), is situated about five and a half miles from Daventry, in the county of Northampton; it contains nothing of importance, if we except the Oxford canal, which passes through the parish, and, the ancient Roman Watling-street, that marks its western boundary.

The county of Northampton, through part of which the London and Birmingham Railroad passes, possesses such peculiarities in its strata, as demand particular notice, and especially illustrate the importance of geological knowledge, as a science worthy the attentive study of the practical engineer.

The line of country intersected by the London and Birmingham Railroad is peculiarly favourable to geological investigation; and its excavations and cuttings have already added much to the value of private cabinets, by the mineral riches developed during the progress of the works. Commencing from Primrose Hill Tunnel (which passes through the London clay strata), we follow its course, marking the gradation of the strata, which perfectly agree with the arrangement and consecutive order enumerated by Conybeare and Phillips, and whose section and map†, by a curious coincidence, mark (near enough for our purpose) the route of the railway from London, to its terminus at Birmingham.—Thus: we have in succession the following strata (either by bassett or section as formed by excavation) presented to our notice. 1st, The *London clay;* 2d, the *Plaster clay;* 3d, the *Chalk;* 4th, the *Chalk, Marle, &c.;* 5th, the *Weald clay;* 6th, the *Iron sand*‡; 7th, *Oxford clunch;* 8th, *Great Oolite, &c.;* and at Kilsby, near Daventry, the *inferior Ooli* its accompanying sandy beds. present instance, it is not neces follow the sectional line any f since the subject of the presen trations, is situated in the last strata. The general aspect of th try offers itself first to our notice; for the greater part, may be descr consisting of vale and upland, spersed with extensive woods, a fact, presenting the most deligh riety of inland scenery, further en by the high degree of cultivation, a throughout the whole tract of co The greatest altitude of the land a to be near the spot that more parti concerns this description. The s of the hills surrounding Davent about 800 feet above the level Thames at Brentford. The i Oolitic system, or formation, w the sub-stratum of the whole of t trict, is, according to the exten general classification of the Rever Conybeare, an alternating conge beds, or layers, as follows:—1st, limestones; 2d, Calcareo-siliceou and sandstones; and, lastly, argill and argilla-calcareous beds. The stone called the inferior Oolite, upon calcareo-silliceous beds of sa which pass insensibly into other The presence of a greater quan sand among the inferior Oolitic than among the middle or upper d of the series, renders any tun operation in that particular strata ter of great risk, and should alw attended with more than ordina caution. This description of dry ling, and in such strata as we have to, the miner, unless protected by of solid rock, may be so suddenl taken by a running sand from jacent layer, not only defying tempts to stop the irruption, bu mately causing him to seek his own in flight. These difficulties wer rally encountered at the Kilsby T but by perseverance and skilful m ment were at last made to yield of the engineer. Where denud sapping causes have actively op the Oolitic strata has been thrown by the subsidence or slipping

* The illustrations here given are reduced from the original drawings furnished by the writer to "Simm's Public Works of Great Britain."

† Geology of England and Wales.

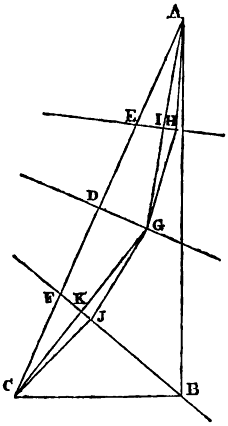
‡ There are intermediate strata that do not appear at this part of the country—viz., Aylesbury limestone, &c., and coral rag, &c.

* Gorton, Top. Dic. Art., Northamptons

Weald clay that underlies it. The dislocations occasioned to the rocky stratum by such subsidence when encountered by the engineer, require energetic measures on his behalf to counteract the effect of the enormous thrust to which his mining operations would otherwise be subjected. The insertion of iron rods* longitudinally to the line of direction, is a measure well calculated to uphold the work against any ordinary strain to which it may now, or hereafter be liable.

A judicious battering or sloping of the walls is also a matter of considerable moment, and our references will abundantly show that this desirable precaution has not been neglected in the work in question. To enable the young engineer to set out the batter and curvature of the walls, the following diagram, fig. II, is annexed, and may be described

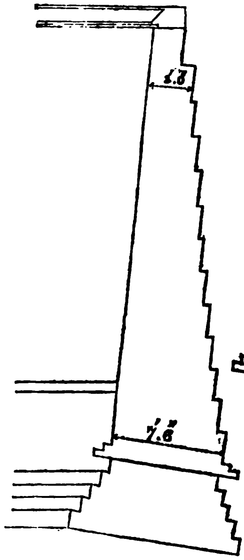
Fig. II.

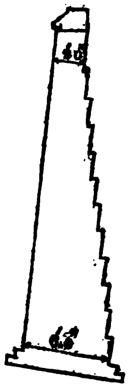


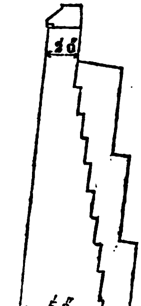
as follows:—Let A B, B C, be given, join A C, and bisect it in D; make $DG = CD \div 4$, join C G, G A, bisect them at I and K, let $HI\ KI = DG \div 4$; join C J, J G, G H, H A, and so on, *ad infinitum*. C J G H A, are points in a curve that is a tangent to A B, and projects B C.

The Kilsby Tunnel (see front page) exhibits an appropriate architectural character of the castellated kind, having a bold projecting upper cornice with machicollations. The wing walls, &c., are respectively shown by the sections through the lines I. II. III. IV. V., fig. 1,

Fig. III Fig. IV







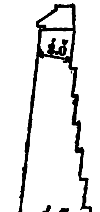


Fig. V Fig. VI. Fig. VII

and exhibit the thickness of the brickwork at those parts. See figs. III, IV, V, VI, and VII.

(To be continued.)

* See their position in fig. 1, on the archstones of the Tunnel.

ADVANTAGES OF THE RAILWAY SYSTEM.

Sir,—Every one who cares at all for the internal and political improvement of his native land, every well-wisher to his country, must necessarily take a lively interest in the success and encouragement of railways. The advantages of this mode of travelling are so obvious that no one but the most thoroughly unenlightened individual can fail to perceive them. To a commercial nation, especially like the English, rapidity of communication from place to place, and from town to town, ought certainly to be regarded as one of the most important objects which it is the interest, not only of the legislator, but of every other person, whether public or private, to cultivate. To the merchant, of what infinite value must it be to have his goods transported to their different places of destination, in half or quarter the time usually employed, at less cost than before, independent of the gains that would accrue to him from not being compelled to sutain so many expenses of lading, stowing, warehouseroom, &c. which in the common mode of conveyance are inevitable. Again, how convenient must it prove to the community at large to have letters transported to and fro in such a very short space of time as is contemplated to be the case by persons who are concerned in the management of steam conveyance. The works on the railroads have another paramount advantage, since they find employment for immense numbers of labourers and mechanics who would otherwise doubtless be obliged either to starve or to throw themselves upon the parish for support. It has been often urged that the increase of steam conveyance will not only not diminish the demand for horses but will tend to augment it; and this argument is grounded upon the assertion, that vast numbers of horses will be required to convey passengers to the railway stations from different parts of the kingdom, but this, in my opinion will be rendered entirely unnecessary by the construction of branch railroads from the various country villages and towns; and I have no doubt but that within a period of about ten years from this time, we shall see the whole country from one end to the other intersected with them. The two principal lines at present in progress are the Birmingham and Great Western railroads; about sixty miles of the former are now in a tolerable fit state for travelling, viz., thirty miles from Birmingham, and about thirty-two miles from London as far as Tring, to which place passengers are transported in about an hour and a-half; to Boxmoor about twenty-four miles in one hour and a quarter, and to Watford eighteen miles in three quarters of an hour. It is also supposed that twenty-six miles of the Great Western line will be opened to the public in a few weeks. Mr. Brunel, the engineer has constructed the road in such a manner that the least velocity, it is said, will be about five-and-twenty miles per hour!

There have lately been several accidents upon the Birmingham Railway which have mostly originated from the want of caution upon the part of those entrusted with the care of the engines, and many people have been deterred from travelling on it, by the fear of incurring similar danger; but the whole affair is now only in its infancy, and it is to be hoped that in due course of time such precautions will be taken, as to render the recurrence of such mishaps almost next to impossible. I have long observed the danger which is incurred by persons throwing stones on the rails, whereby the carriages are very likely to be jerked off the rails, and as mischievous persons cannot entirely be deterred from such practices, by all the threats made use of to guard against them, I am therefore very anxious to enquire whether something could not be contrived to fix on the engine, so as to sweep away before the wheels, any impediment which might by chance be in the way. By an instument of this kind, every possibility of accidents from stones, &c., would entirely be done away with.*

Your future correspondent

J. W. T.

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* Our Correspondent cannot be a very regular reader of our Magazine, otherwise he would have been aware that only two weeks since our front page engraving was of an apparatus for this purpose, invented and patented by Mr. Hawthorn. Several other contrivances also appeared in some of our previous volumes. We may mention one by Sir George Cayley, (see No. 404,) and also one by Col. Maceroni, (see No. 435.)—ED. M. M.

INTERESTING ASTRONOMICAL PHENOMENON.

Sir,—There is a singular circumstance connected with the astronomical question answered at page 70 of your last monthly part, which, as it has not yet been noticed, and as it may prove interesting to your readers, I transmit for insertion.

It is, that the stars Capella and Procyon are in the same vertical, *twice* in the same night, at the same places, within certain limits of latitude.

This will be evident from the following particulars calculated for the beginning of 1838 :—

	N. Latitude.	Sid. Time.
Phenomenon begins with Procyon rising..........	57°. 22′. 32″....	$0^h. 55^m. 24^s$..*a*
Vertical line proceeds *northwards*, until at right angles with Meridian at....................	57 . 59 . 10	1 . 45 . 0..*b*
Vertical line returns southwards over same places until it is again at.......................	57 . 22 . 32	2 . 32 . 34 ..*c*
Phenomena ends at the eastern side of Meridian with the transit of Capella..................	45 . 59 . 50	5 . 4 . 45
Recommences at the western side of Meridian with the transit of Procyon in..................	5 . 39 . 10	7 . 30 . 50
Ends *finally* with the setting of Capella South Lat..	26 . 53 . 8	8 . 58 . 55

It will be seen, therefore, that to all places lying between the limits 57°.22′. 32″, and 57°. 59′. 10″, North Lat.; these two stars will be in the same vertical, *twice*, during the same night, once on either side of the prime vertical.

Your correspondent, O. N., seems, like Antæus, to acquire fresh confidence (if not strength) the oftener he is floored; I should otherwise animadvert more at length upon his letter at page 69. He, first, invents an error, and next, most complacently sets about correcting it. I have no where "*insinuated*" that the longitude was not necessary in the *auxiliary* process of converting *sidereal* into *mean* time; but as it is a simple tabular process common to all time problems, *where mean time is required;* so it cannot be said to form a component part of any of them, but is distinct and independent. The particulars of the phenomenon above given furnish an excellent illustration of how much superior sidereal time, which is common to all longitudes, is to mean time, in similar investigations.

O. N. has made another unfortunate slip, when he says in answer to Iver M'Iver's question of "why the perpendicular P N must fall upon D Z produced?" that "if it did not so, the zenith distance of Procyon would be *greater* than 90°." Now a slight consideration of the particulars before given will show, that from *a* to *b* the perpendicular P N must fall *inside* of the triangle and not upon D Z produced, and yet, that the Zenith distance of Procyon is *less* than 90°, since it has already risen. It is not 'till after *b*, that it becomes necessary to produce D Z.

I am, Sir,

Your obedient servant,

NAUTILUS.

December 15, 1837.

MR. UTTING'S ASTRONOMICAL TABLES. A FEW MORE WORDS FROM A SCOTCH DOMINIE.

Sir,—When I wrote my last letter (No. 747), I had not then by me your 736th number, otherwise I should have first replied to Mr. Utting's letter in that number; having now perused it, I beg leave to offer a few remarks upon it.

Mr. Utting still continues to harp upon me being a nameless correspondent, and he pledges himself to confute all my calculations, provided I will affix my name to my articles. In answer to this *request, I beg leave to inform him,* that if he can show any solid reason, why I in particular, out of the numerous able and nameless contributors to your useful Magazine, should be selected, and if he can persuade you, Mr. Editor, that there is any necessity for my so doing, then, by the "shade of St. Maronoch!" he shall have it. In the meantime, however, I would seriously advise Mr. Utting, if he has any regard for his scientific attainments, not to stop for such a contingency, but to proceed forthwith in

his promised refuting system. And I also pledge myself, Mr. Editor, most readily to admit any errors he can point out, *arising from any false principles* I may have proceeded upon, in my various lucubrations, on this simple, but very important part of astronomy. It is true, that Mr. Utting has, in what I have designated his nibbling system, made one discovery, to which he no doubt attaches a mighty degree of importance, and that is, that in calculating the mean tropical period of the earth (see No. 722, p. 147), I committed an arithmetical slip (not from any false principle), amounting to no less a quantity than nearly half a second of time! The Cambridge Student in his remarks on Mr. Utting's solution of his Astronomical Question (No. 745), has shown that Mr. U. has also fallen into a *small error*, not, however, from any arithmetical slip of the pen, but from an unfortunate deviation from well-known facts. Mr. U.'s error, instead of being somewhat less than half a second of time, is somewhat more than 1533 mean solar days in one periodical revolution of the planet! And if Mr. U. had had perfect faith in his own Astronomical Tables, and calculated the required period from his own principles and tables, the error would have been somewhat more than 3362 mean solar days in one periodical revolution of the planet! Archimedes considered the application of arithmetic, in deducing final results from facts established upon mathematical or physical principles, as the drudgery of science. In this certainly necessary department, Mr. U. is in general extremely accurate; but where he has to grapple with mathematical or physical science, the pages of the *Mechanics' Magazine* furnish abundance of proof that he has still much to learn. Had he studied the principles of Newton, with the same degree of ardour as he seems to have devoted to the contemptible trash of that silly knight, Sir Richard Phillips, the probability would have been that we would have had his Astronomical Tables in a more perfect form.

Mr. Utting informs me (page 397,) that I have improperly designated the periods of the planets. He seems to insinuate that there is a difference between the sidereal and periodic revolution of a planet; perhaps he will in his next communication tell us the difference between them. "Are not (says Mr. U.) tropical, anomalistical and synodic periods, perodical periods also?"

Mr. Utting, I am sure, has heard of Kepler's Third Law, to wit, "that the squares of the periodic times are as the cubes of the mean distances, &c." Some astronomers enumerate the same law by saying, "The squares of the sidereal periods are as the cubes of the mean distances, &c.;" of course it must be understood that a periodic and sidereal period of a planet are the same. In short, a periodic or sidereal period of a planet is the mean time the planet takes in making a complete revolution of the heavens, or a circuit, containing 360 degrees. A tropical revolution is somewhat less than 360°; an anomalistic revolution is greater than 360°; but a synodic revolution may be greater or less than 360°, according as the planet happens to be an inferior or superior one; the same is to be understood of the satellites of the different planets: with this modification, that a synodic revolution is always greater than 360°. There are one or two more statements in Mr. U.'s letter to which I might reply, but as they are not of great importance, and as this letter, is, perhaps, of sufficient length, I shall conclude, by wishing you, Mr. Editor, and all your correspondents and readers, a happy new year.

I am, Mr. Editor, yours, &c.

A SCOTCH DOMINIE.

Forfarshire, Dec, 12, 1837.

PRACTICAL HINTS TO SPORTSMEN.—NOTE ON FIRE-PROOF CEILINGS, &c.

Sir,—I send you four of sixteen papers, with drawings and experimental proofs, which I laid before the Master General of the Ordnance, and the Duke of Clarence, when Lord High Admiral of this empire, in 1826 and 1827. If you think them likely to be amusing to your readers, I will send you several others, all proved by extensive and repeated trials, to be founded upon fact.*

I find that in my last communication, I forgot to allude to some points of your recent correspondence which struck my attention. First, I see that the bouyant

* The papers sent us are very ingenious, and shall be inserted in succession as soon as we can find room for them; the first probably in our next.—ED. M. M.

paddle wheel is spoken of, without any body asking whether the power gained by the rising of the bouyant paddle on one side, is not the same as that consumed in forcing it under water on the other?

Secondly, I forgot when speaking of loading fire arms, to say, that when a gun gets foul, it may be speadily cleaned by loading it with a quarter of a charge of powder, and then ramming down green grass, or the juicy leaves of plants, which wetting the barrel, will be discharged together with the foulness, on firing off the powder. This will serve as a succedaneum to washing the barrel when in the field, where turnip leaves are easily found.

Thirdly,—I forgot to state, that corks can be very correctly cut or rasped for waddings, by opening the shanks of a couple of metal buttons. and filing them into sharp points; then stick them at the two ends of a piece of cork, and the knife or rasp will work round them so as to produce a perfect cylinder. If a conical cork is wanted, put to one end a certain sized button, at the other a smaller one. This plan, I gave you many years ago.

Fourthly,—I beg to bear witness to the good qualities of a metallic wad for fowling pieces, the maker of which (I think) is named Butler; but in using them, I must caution your sporting readers, always to place *two* over the powder, because the inventor having made nicks in the periphery to allow of the escape of the air in pushing them down, the said nicks allow of too great a loss of power, and of introduction into the charge of shot, of the blast of the powder; when two such wads are placed one over the other, it is probable that the nicks will rarely correspond just one over the other, so that the windage will be diminished. Moreover, they are rather too thin, and liable to give way when single.

Fifthly,—I forgot, when speaking of ball and buck-shot cartridges, to say that the best paper for their construction is the very thin brown paper, often used by oilmen, or the thin blue used by grocers. These papers are thinner than ordinary post paper, but four times as tough, and when the cartridge cases are made of such, and then varnished with copal, or a solution of shoe-makers' wax, (tallow. wax, and rosin) in spirits of turpentine, they will last a length of time even if carried in the pockets.

Lastly,—I beg leave to agree with your valuable and sagacious correspondent, Mr. Baddeley, that a good plaster ceiling is proof against flame, almost as much as sheet iron. But I will add that a pigment composed of equal parts of alum, lime, soap, and size, applied to timber will make it very difficult to ignite. For out-door work, the soap must be omitted. I would *first* apply to the timber a strong solution of alum, after that the pigment of alum, lime, and size. A flat surface of boards is of very difficult ignition; a little artificial aid might check or delay the progress of a fire in a very great degree. I have seen the whole bright contents of a grate, turned over on to the floor of a room, and merely char a hole in the boards.

My plan for preserving thatch from fire I strongly recommend to your country readers.

I have the honour to be, Sir,

Your obedient servant,

F. MACERONI.

London, December 21, 1837.

P. S. In a former number (749) of your most excellent periodical, I have given instructions on the practice of rifle, gun, and pistol shooting with ball.

MR. ERICSSON'S STEAM-BOAT PROPELLER.

(From a Correspondent.)

It may easily be proved that no material improvement in steam navigation can be effected unless the paddle wheel is superseded by some propelling apparatus constructed in accordance with the following conditions, viz, 1stly. That it admits of expansive action in the engines at all times. 2ndly. That the heeling of the vessel produced by a free use of the sails or a heavy sea, shall not impede or diminish its propelling properties. And 3dly. That the power communicated to the propeller by the engines, shall always give an equal propelling force to the vessel, notwithstanding any variations in the draught of water, whether produced by increase or diminution of cargo, pressure of sails, or a heavy sea.

These conditions being fulfilled, it becomes a matter of easy demonstration, that with only *one half of the quantity of fuel now required*, a steam-boat may be propelled any given distance in much shorter time, on an average, than at present, thereby producing a double advantage, besides rendering the steam-boat thoroughly efficient and safe for sea going purposes. The propeller under consideration possesses every quality contained in the above conditions, and it is in an eminent degree suited for expansive action in the engines, since under no circumstances, can the resistance opposed to it be increased, though it may sometimes be diminished: a circumstance by no means prejudicial to expansive action.

An experimental steam-boat 45 feet long 8½ feet beam (fitted with two high pressure engines, of 12 inches diameter, and 14 inches stroke) has been built for the express purpose of trying the new propeller, and a variety of experiments have been made, in the presence of several distinguished and eminent nautical men and engineers, all proving that the effect of the new propeller is considerably greater than that of the paddle-wheel; in other words, the resistance obtained by the new propeller is more perfect, and consequently its required velocity, as compared to the speed of the vessel, less than the velocity required by the paddle-wheel to produce an equal effect.

The result of the experiments which have been made, may be summed up in the following four leading facts.

1stly. That a velocity of 9¾ miles per hour, was obtained with 84 revolutions of the propeller, the inclination of the spiral planes being 34 degrees at the circumference, with a gradual increase towards the centre. Now the circumference of the propeller being 16,2 feet, and the inclination 34 degrees, it follows that if the water had not receded at all, the boat could only have been propelled 10,8 feet for each revolution of the propeller, or 907 feet per minute: But 9¾ miles per hour is 858 feet, per minute, hence the loss of speed, only 49 out of 907, or less than $\frac{1}{18}$, thus showing a very great advantage over the common paddle-wheel: the resistance being thus nearly perfect.

2ndly. A ship registering 650 tons was towed at the of full 4½, knots per hour, or precisely 7 feet per second, with 60 revolutions per minute in the propeller: the ship drew at the time 14 feet 6 inches of water measuring 32 feet in the beam, the sectional area being upwards of 370 square feet under water. According to the dimensions before stated, it will be seen that had the resistence been perfect, the ship could only have gone at the rate of 648 feet per minute, instead of 420, thus showing a loss of only 228, out of 648, which comparing the immense mass propelled to the small bulk of the propeller (5 feet 2 inches diameter, and 2 feet 3 inches wide) may justly be considered as an extraordinary achievement: the result being in a mechanical point of view interesting in in the highest degree.

3rdly. A lever acting on the principle of a steelyard, but bent at the fulcrum, was applied on board the experimental boat, having its short end attached to a fixed point on shore, by means of a hawser, the other end of the lever supporting a weight as usual. The engines being then set to work the tension on the hawser, indicated by the lever, proved that the propelling force increased exactly as the square of the velocity of the propeller; the tension on the hawser being upwards of 2,000 lbs. when the engines worked at full speed.

4thly. The inclination of the spiral planes having been changed to an angle averaging 43½ degrees for both series, it was found that 60 revolutions in the propeller, produced a speed of nearly 9½ miles an hour, or 836 feet per minute: (greater pressure of steam in the engines being of course required than in the former experiment.) Now the inclination of the planes being 43½ degrees at the circumference, a speed of 895 feet per minute, could only have been produced had the resistance been perfect, thus showing a loss of speed of not more than 1-15th: at the same time establishing the important fact, that by increasing the inclination of the planes (more powerful engines being of course required in that case) the speed of the vessel may be greatly increased, without increasing the speed in the propeller.

The chief advantages to be derived from the new propeller are as follow, viz:—

1stly. A saving of power amounting to nearly one half, as compared to steam-boats at present, will be effected by the

almost perfect resistance obtained, together with the circumstance that from no cause whatever can that resistance be increased: hence expansive action is applicable. The great waste of power occasioned by the action of the sea, on the paddle-wheel being prevented by the new propeller, an additional saving will be effected in sea going vessels.

2ndly. The new propeller is particularly applicable to inland navigation, which, in consequence of the impossibility of passing locks and other narrow places with steam-boats, propelled by the ordinary paddle-wheel, is it present deprived of the advantage of steam power.

3rdly. The new propeller occupying no space on the sides of the vessel, will in crowded rivers like the Thames, effect a saving of space in itself of paramount importance; for one-half of the with of the present channel would allow an equal number of steam-boats, fitted with the new propeller, to pass as at present.

4thly. The introduction of the new propeller, will also prevent the heavy-swell produced by the paddle-wheel; besides which, an advantage of serious importance will be derived, viz.: the complete prevention of the frequent accidents of persons of persons being drawn under the paddle wheels.

5thly. The action of the new propeller is perfectly uniform, and free from the tremulous motion produced by the irregular action of the present paddles.

6thly. Engines constructed to work this propeller, will be more steady in their action, and consequently less distressing to the vessel than at present, the driving shaft being placed near the bottom; besides which the weight and size of engine frames will be reduced very considerably.

7thly. This propeller may also be applied to the stern of ordinary sailing vessels, and worked by a small high-pressure engine, to be used in calms or light winds, during which a rate of five knots an hour may be obtained with a very moderate expenditure of power: for the *Toronto* packet ship of 650 tons was towed at the rate of $4\frac{1}{2}$ knots, with two 12 inches cylinders, and 14 inches stroke, making only 60 revolutions per minute. On account of the extreme lightness of the propeller (the one used for towing the *Toronto* weighing *only 615 lbs.) it may be* made to *ship and unship with great facility.*

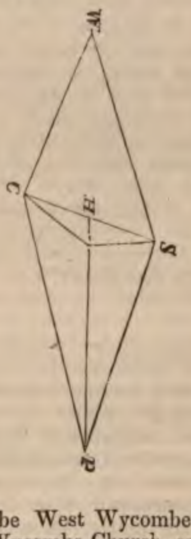
8thly. For war purposes this propeller is of the greatest importance since it works entirely under water, out of reach of shot, with engines working at the very bottom of the vessel: properties most essential in a war steamer.

QUESTION IN SURVEYING.

Sir,—I will esteem it as a most particular favour if any of your numerous practical or mathematical contributors, will give a plain solution of the following trigonometrical question from professor Dalby's course of mathematics, which I have often attempted to solve, but without success.

I am, Sir,
Your obedient servant,
A. B. White.

Bath, Dec. 10, 1837.



Let W be West Wycombe Church, H, High Wycombe Church, and P Pen Beacon Pole: Now at the stations, C and S we took the following angles with a theodolite.

At C	W C S	=	108° . . 14′
	S C H	=	28 . . 20
	S C P	=	33 . . 51
At S	W S C	=	42° . . 42′
	C S H	=	25 . . 26
	C S P	=	126 . . 20

By a previous operation the distance W H (between the churches) was found to be 4646 yards. Hence the distance from Pen Beacon to West Wycombe church is required?

COMMON ROAD LOCOMOTION.

Sir,—As your correspondent L. M. B., in No. 747, of the *Mechanics' Magazine*, appears to be a resident in Birmingham, I beg leave to state, that if he will take the trouble of calling at my house, I shall be happy in showing him a locomotive carriage in a state of great forwardness, intended *decidedly* for common roads.*

Carriage locomotionists in general have confined themselves to the centripetal principal; now the crank working round the centre of the driving wheels merely, has no propulsive influence, and without propulsion in the method, of applying the power it is impossible to be successful. If steam power be applied through a good propulsive method than a given power *locomotively* will equal the same amount of work as if it were a stationary engine. To this perfection locomotives will undoubtedly arrive, and then will be the time for fair comparison between the roads and rails, especially if road locomotions should have the advantage given to them of granite trams, as designed by the London and Holyhead Steam Coach Company.

I remain, Sir,
Your most obliged servant,
G. MILLICHAP.

85, Aston-street, Birmingham,
Dec. 12, 1837.

IMPROVEMENTS IN GAS RETORT BEDS.

SIR,—As the most economical method of working gas retorts is a subject of considerable importance both to the the managers and shareholders of gas establishments, my object in addressing your correspondent Peter Pindar, was to elicit such information on the subject as would enable the parties interested to judge by comparative experiments, whether Mr. Hutchison's plan does in reality carbonize the greatest quantity of coal from a given quantity of fuel; and in his reply to my observations, I was much disappointed that the information necessary was withheld. At the request of Peter Pindar, I referred to his letter in No. 671, and was both surprised and disappointed to find that neither the quantity of fuel used, or coal carbonized, is given. Peter Pindar is at fault in supposing I was interested in the Brighton Gas Company's management, as I never saw that establishment, and have no such wish, if they manage to charge their tanks with tar and ammonia; but I can state for the information of Peter Pindar, that a friend of mine who inspected the works at Vauxhall-bridge, under Mr. Hutchison's management, a short time since, questioned the foreman who went through with him, as to the economy of fuel from the plan adopted in that establishment. The answer was, he did not consider there was any saving, as the one furnance being more capacious required as much fuel for the duty it had to perform, as the furnaces on the previous plan. Whether or not he stated the truth, I leave to the enquiry of Peter Pindar. Unless he can and will bring forward some well defined and satisfactory experiments on the new system as compared with the old, I fear very little utility will be gained by continuing the correspondence. I can assure him that I have no other object in view by this discussion, than to call forth such information as may enable the public to judge of the merit of the plan he recommends.

I am, Sir,
Your obedient servant,
R. Y.

December 19, 1837.

ALEXANDER'S TELEGRAPH—WRITING MACHINE—PATENT LAW GRIEVANCE—MACHINE FOR PRODUCING ELECTRICAL LIGHT.

Sir,—I first met with an account of Alexander's Telegraph last night in the *Mechanics' Magazine*, and a very important improvement suggested itself, which will render fifteen of the thirty-one wires unnecessary. I see no reason why each of fifteen wires should not represent two letters, thus; let each of the letter screens affixed to the moveable magnets be wide enough to cover two letters. Then the positive end of the galvanic battery being connected with the inducing wire, by a touch of the keys, the magnet and screen will move in one direction and discover one letter. The negative end of the battery being thus connected with the same wire, the magnet will move in the

* *If Mr. Millichap will favour us with a description of his steam carriage, we shall be happy to publish it.—*ED. M. M.

y direction and discover the other There must of course be some-xed to prevent the magnet going n either direction as to discover tters. The returning wire con-with all the other thirty, must of have its connection with the poles reversed, at the same time ettered wire.

having seen a model of the instru-i am in doubt whether the magnet not, on returning to its stationary i, want a contrivance to prevent its ion; I have therefore devised the ng plan which would perhaps be t of the two :—Let each wire act wo magnets and screens, one and screen moving in one direc-ut prevented from moving in the s now. The current of electricity rsed, would, on account of this ion not move *this* magnet and in the opposite direction, but it he *other* magnet and screen, hav-similar stop or prevention, but on the other side of the pole.

ems many persons have formed for telegraphs, I too, formed mine, pared a specification of it five years id that included the plan of mak-wire only serve for the returning r all the rest, as in Alexander's oh; but even that might I think ensed with where a good discharg-n, as gas or water pipes, at each the telegraph could be obtained. to the Admiralty at the time I n on the subject of my invention, cilitating commercial correspon-t seems was too contemptible a for state philanthrophy.

telegraph was designed to print own communications (and I think be made to convey hundreds in a) by means of a machine I invented dly writing in the common print-racters, and which I wished to ne one to join me in perfecting tenting, but was unsuccessful as been in two or three other in-in which others are now reaping antages which I should have done but for that infamous plundering s upon talent, the English Patent I think the following method serve to secure the poor man's without interfering with the legal of plunder. Let him have the of *filinga specification* (quere, or *openwhich should* have the?) effect of preventing every other person, and also himself, from deriving any benefit from his invention, till the plunderers by legal authority should have had their "pound of flesh."

This preliminary specification should enable the inventor to take a patent for anything coming fairly within its scope and spirit. It would enable him to enter into a contract on fair terms with any person able to bear the expense of a patent, which he cannot now do without risk of being victimised as I have lately had reason to know to my cost. There is also a valuable protection that I think might be extended to scientific, as it is to literary inventions. A man's play cannot be exhibited to others without his sanction. There is just as good reason why a working model of either a useful or pleasing piece of mechanism should be protected from piracy. I may mention as an instance (of which there are many others,) that I am constructing a model twenty-inches broad by twenty-four long and twenty-four high, for a machine to produce light by a succession of electric sparks. I have completed one element which is, of itself, all but suffi-cient to read by, and when the other elements are complete, it will be certainly capable of being thirty-two as powerful and not improbably sixty or one hundred times. A larger one which I had com-menced (but fear will be too expensive for me to complete, in the present un-protected state of science,) is eight feet, by four feet eight inches high, and I calculate would produce a million, and not im-probably many millions of sparks of various colours in a minute, and would give 100,000 moderate shocks, or, (by combination) 4,000 or 5,000 far too intense for endurance, in the same short period.

This would doubtless form a very ex-cellent subject for exhibition; but as any blockhead may imitate, I have given up the thought at least for the present.

CORPUSCULUM.

December 8, 1837.

AVERY'S ROTARY ENGINE, HERO'S REVIVED.

Sir,—Ancient Egypt is considered, and justly so, the cradle of the sciences and arts. Pythagorus, Plato, Democretus and others of the Greek sages travelled into that country to acquire the higher

branches of their knowledge. It was in short, the university of the ancient world; to be "learned in all the wisdom of the Egyptians," conferred a marked distinction upon an individual. Now, among "divers other dainty devices" in use amongst the magicians, astrologers, soothsayers, and other conjurers who "ministered in the mysteries" of Serapis, by which they were enabled to "astonish the natives" and draw *denarii* from their pockets, there was a certain *elopile* or spinning toy, something like a common tea kettle with a whirling handle, which the magnanimous moderns have dignified with the name of a steam-engine.

Now, I will inform you, how this whirling machine came to be called by the name of my much respected and renowned ancester. When Alexander the Great had conquered Egypt, the Greeks of course became masters of the country, temples and all. Now, as the Greeks had long desired to become acquainted with the "arts of the Egyptians," I need not say that they availed themselves of the opportunity thus presented to them of penetrating into their most secret mysteries, and in this searching business no one was more active than my worthy ancestor Hero of Alexandria. He collected with diligence and assiduity; and the whole of his collection has come down to us in his excellent work *Spiritalia*. But Hero does not claim the little whirling machine which goes by his name, as *his own invention*. My progenitor lived at Alexandria some time before the commencement of the Christian era, that is nearly 2,000 years ago, and this little engine had been known in Egypt long before that time, so that as you will perceive this engine called Hero's, has been in existance for 2 or 3,000 years at least.

What I have to complain of is this, a certain Mr. Avery, a mere modern, a man who is but of yesterday, nay, the very world which gave him birth is but a new and raw thing, for he belongs to the "new world," claims to be the *inventor* of this very old machine, and the engine is now called Avery's engine instead of Hero's, to *whom it rightfully* belongs, by the right *of prescription*, if not by that of *invention*.

Mr. Avery has taken Hero's engine, and having squeezed the cylindrical arms into a somewhat flattened form, and enclosed it in a box, to prevent the steam from whisking about, he has dubbed it "Avery's engine." Now, in the first place, this is neither fair nor honourable, and in the second place, I think I can show very satisfactorily, that neither Mr. Avery nor his agents in Scotland understand the principle upon which the engine works and gives out its power. If they did, they would certainly be more cautious in their statement respecting the amount of mechanical power which may be obtained from a given quantity of steam or fuel. If they had a clear conception of the principle upon which it works, they would not bring it into comparison with the piston steam-engine, so perseveringly as is done in their prospectuses.

In order to take a true measure of the power to be obtained from a *given* quantity of steam transmitted through the arms of Avery's or rather Hero's engine, (I like to call things by their right names,) it is essentially requisite that a clear and distinct perception should be obtained of the pressure of fluids; neither must the reaction of the issuing steam upon the atmosphere be overlooked; for *both* conspire to produce the effect. The latter is strenuously denied by Avery and others, although for what object it would be difficult to conceive, for so long as a given amount of power is procured from a given quantity of steam, what matters it whether by reaction or otherwise? But I must leave these matters for another epistle.

Your Friend,

HERO THE YOUNGER.

Alexandria, Dec. 1837

TRUCK FOR ICE LIFE-BOATS.

Sir,—It has often been a matter of surprise to me, to observe the manner in which the ice boats (I believe they are so called,) are conveyed from one part of the Serpentine to another. I would propose, with due difference to the Royal Humane Society, that a truck with wheels should be provided, on which the boats might be placed, and drawn quickly to any spot where their aid is required. At present they have to be drawn over a gravelly soil, to a distance sometimes of 100 yards or more; so that when a

person falls through the ice, the boat cannot be brought to his assistance for at least ten or fifteen minutes, by which time he is nearly (if not quite) exhausted.

I am, Sir,

A WELL-WISHER OF YOUR MAGAZINE.

BELL'S PATENT IMPROVEMENTS IN HEATING AND EVAPORATING FLUIDS.

(Communicated by the Patentee.)

Few questions connected with science, manufactures, and commerce have attracted the attention of the scientific, as well as of the practical inquirers, more than matters relating to the saving of fuel in the heating and evaporation of fluids, and to the rapid generation of steam; and consequently, there are few points in which the principles which govern any process, have of late years been more carefully studied or more thoroughly developed, or in which the difficulties to be surmounted have been more accurately ascertained.

The intelligence, ingenuity, and skill of engineers have succeeded to a wonderful extent in the application of heat arising from fuel under combustion; and whether the object in view, is merely the evaporation of the greatest quantity of fluid by the smallest quantity of fuel, or, what in some measure is the converse of this, the most rapid generation of the greatest amount of steam, regardless of the fuel consumed, or whether it be a combination of these two results, much has been effected. Much, however, still remains to be done.

In the processes of distillation, brewing, the making of salt, and many others, and in stationary steam engines, the extension of the fire surface, the most effectual and direct mode of application of heat, may be carried to a considerable extent; even in these cases, however, there is a limit to this mode of transmitting heat. But in many other cases, necessity has compelled the limitation of the fire surface, and the introduction of the flue surface, in order that the smoke, which by limiting the fire surface is given off at a greater degree of heat, may be deprived of this extra caloric in its transit through the flues.

But there is a limit to the extent to which even this mode of transmitting heat may be carried; a limit imposed by obvious considerations, to overcome which, various plans have been devised, such as increasing the draft of the chimney by the use of blowing apparatus, and the mixing atmospheric air with the smoke and products of the fuel in various ways; and upon these objects, much ingenuity has been exercised.

There are, however, disadvantages, to which all these plans are obviously exposed. The smoke and air, when once discharged into the chimney become unmanageable, and must be allowed to escape, at whatever degree of heat they may be so discharged. The flue surface, and even the fire surface inevitably become charged with the refuse of the fuel which, acting as non-conductors, prevent the transmission of the heat in a greater or less degree. The necessity of rapid and powerful generation of steam in locomotive engines, which are now coming into such extensive employment, has led to the heat of the furnace, and of the flues being forced to such an amount of intensity, and the draft through the latter, being carried to such an extent of rapidity, that the heat cannot be transmitted with sufficient speed, and the materials employed in their construction are quickly injured, in many cases totally destroyed. Even in marine boilers, these difficulties have, more or less, to be contended against, while others of a different character, and less in importance only to those which have been mentioned, inevitably arise.

There is also little doubt, that in the rapid combustion of the large quantities of fuel now used in furnaces, much of the caloric generated in the fiercest part of the fire, is not directly, nor beneficially applied to the object in view, while in many processes, the speed of the draft through the flues, prevents the vapours from parting with the heat to the requisite and proper extent.

It seems, therefore, to be pretty apparent, that if some of these difficulties can be surmounted in an expedient way,—if the transmitting surface can be expediently increased, especially without enlarging the boiler,—benefit will accrue in the process of evaporation, whether in the steam engine, or in brewing, distilling, and other operations.

These views led to the consideration of the suggestion, whether air heated to a high degree, forced by blowing through the fluid, in tubes or otherwise, *unmixed with the products of the fire, and under a controlling power different from, and independent of the flue draft*, might not be employed as a powerful accessory in this process. Various long-continued, and pretty extensive experiments made in consequence by a chemist of great celebrity, in this, (which is essentially a chemical question*) have proved, that im-

* In a boiler constructed as a simple marine boiler, with flue pipes through the water, and containing about 12 cubic feet, "When from 10 to 13 pounds of coal were consumed in driving off a cubic foot of water into steam, the gain by transmitting

portant results are in point of fact attained, and a patent has been taken for the application of heated air, in this way to the heating and evaporating of fluids.

In these experiments, some results arose, which were perhaps rather unexpected. A high degree of heat is rapidly, and easily communicated to the air, which passes through the tubes in the furnace of the boiler. This perhaps arises from the constant radiation of the heat in the interior of the tubes, as well as from the contact of the air with its sides.

The air thus heated, parts readily and quickly with its surplus caloric to the fluid, in its passage through the tubes in the boiler; 7 feet length of five eighth inch tube were sufficient for this result.

When sufficient way space is given to the current of air in its heated state, a small power suffices for forcing it through the tubes.

Finally it is found that as the air, when it left the fluid, was still of a considerable degree of heat, benefit arose in the combustion of the fuel, by the air being discharged under the ash pit.

Various manifest advantages arise from the employment of this method of transmitting heat, which may be denominated tube surface, in contradistinction to fire and flue surface.

Where steam is now used to heat fluids, as in distillation, the making of sugar, soap, &c., heated air is more economical, and will be more efficacious.

In other processes, the transmitting surface is increased, by means not subject to the objections which attach the present modes.

The tubes remaining always clear and uncontaminated, there is no impediment to the transmission of the caloric.

The degree of heat imparted to the air, and the quantity employed, are limited only by the power to heat, and to transmit it.

The heat of the interior of the fire is more equally and effectually distributed, being abstracted from the place where it is of the least benefit, aud applied to the interior of the fluid, with the greatest advantage; and the temperature of the whole heating surface is thus rendered more equable and uniform.

the hot air, amounted in general to about 33 per cent.

"In those cases where the consumption of fuel in proportion to the quantity of steam driven off, was greater, then the gain was stil farther encreased. It amounted in general to from 40 to 43 *per cent.*

"*I am, therefore, decidedly of opinion that in those instances the hot blast may be used with manifest advantage.*

No part of the heat so abstracted from the fire need be wasted or dissipated, but all may be returned to the ash pit, or other parts of the furnace, with manifest advantage in the combustion of fuel, especially when anthracite coal is used; by closing the door of the ash pit, radiation of heat will be prevented, and it may be found that, in locomotive engines especially, the draft of the chimney will establish and keep up the current of air through the whole series of tubes, without the use of any blowing apparatus.

The refrigatory process established by the current of the air through the heating tubes will not only tend to preserve them in part from the destructive influence of the fire, but will in a greater, or less degree diminish the fierce and destructive intensity of the furnace where these results at present arise.

The object of rapid and powerful generation of steam being thus accomplished, in an expedient manner, while at the same time fuel is economised, there is the less necessity for those other methods being abided by, which are obviously subject to objection.

At the same time this method may be employed in conjunction with, and in addition to every improvement already effected, and in every furnace and boiler now in use. And it may be so arranged in certain cases as to save and apply caloric which at present is wasted, by means of pipes for heating the air, for instance, placed in the ash pit of locomotive engines, or in the smoke box where rapid and strong combustion compels the vapours to be discharged at a high temperature. It cannot be doubted that the ingenuity of engineers, will certainly succeed in overcoming the objection from the rapid decay of the heating tubes, by placing them where they will be least prejudicially affected by the fire, attending to the best form for their construction, rendering them easily replaced when necessary, and protecting the requisite places most subject to decay by water tewers, and otherwise.

LIST OF ENGLISH PATENTS GRANTED BETWEEN THE 22D NOVEMBER AND THE 23D DECEMBER, 1837.

James Dowie, of Frederick-street, Edinburgh, boot and shoe-maker, for certain improvements in the construction of boots and shoes, or other coverings for the human foot. Dec. 2; six months to specify.

William Occleshaw, of Manchester, Lancaster, leaden pipe manufacturer, for certain improvements in the machinery or apparatus for manufacturing pipes or tubes, or other similar articles from lead or other metallic substances. Dec. 2; six months.

Thomas William Booker, of Merlin Griffith Works, Glamorganshire, iron master and tin plate

manufacturer, for improvements in preparing iron, to be coated with tin or other metals. Dec. 4: six months.

George Cottam, of Winsley-street, Oxford-street, Middlesex, engineer, for improvements in the construction of wheels for railway and other carriages. Dec. 5; six months.

Moses Poole, of Lincolns-inn, Middlesex, gent., for improvements in looms for weaving figured and ornamented fabrics, being a communication from a foreigner residing abroad. Dec. 5; six months.

Moses Poole, of Lincolns Inn, Middlesex, gent., for improvements in printing, being a communication from a foreigner residing abroad. Dec. 5; six months.

John Hall, of Nottingham, lace manufacturer, for certain improvements in machinery, whereby cloth or woven fabrics of various kinds may be extended or stretched, and dried in an extended state. Dec. 5; six months.

Joshua Taylor Beale, of Church-lane, Whitechapel, Middlesex, engineer, for certain improvements in, and additions to his former invention, known by the title of "a lamp applicable to the burning of substances not hitherto usually burned in such vessels or apparatus," and secured to him by letters patent, dated 4th February, 1834, Dec. 7.

Samuel Mills, of Darlaston Green Iron and Steel Works, near Wednesbury, Stafford, iron master, for improvements in machinery for rolling metals. Dec. 9: six months.

Jeremiah Bynner, of Birmingham, Warwick, lamp manufacturer, for improvements on lamps. Dec. 9; six months.

Benjamin Cook, of Birmingham, brass founder, for an improvement in gas burners, commonly called, or known by the name of Argand Burners. Dec. 9; six months.

Cornelius Ward, of Great Titchfield-street, Marylebone, Middlesex, musical instrument maker, for improvements on the musical instruments designated drums. Dec. 9; six months.

Thomas Vale, of Allen-street, Lambeth, Surry, coach joiner, for improvements in hinges. Dec. 13; six months.

James Hunter, of Leys Mill, Arbroath, Forfar, mechanic, for a machine for boring or perforating stones. Dec. 13; six months.

William Elliott, of Birmingham, button manufacturer, for improvements in the manufacture of covered buttons. Dec. 14; six months.

Thomas Joyce, of Camberwell, New Road, Surry, gardener, for improved apparatus for heating churches, warehouses, shops, factories, hothouses, carriages, and other places requiring artificial heat, and improved fuel to be used therewith. Dec. 16; six months.

Joshua John Lloyd Margary, of Wellington Road St. Johns Wood, Middlesex, Esq., for a new mode of preserving animal and vegetable substances from decay. Dec. 19; six months.

John Gray, of Liverpool, engineer, for certain improvements in steam engines, and apparatus connected therewith, which improvements are particularly applicable to marine engines, for propelling boats or vessels, and part, or parts of which improvements are also applicable to locomotive and stationary steam engines, and other purposes. Dec. 19; six months.

Edmund Butler Rowley, of Charlton-upon-Wedlake, Manchester, surgeon, for certain improvements applicable to locomotive engines, tenders and carriages, to be used upon railways, and which improvements are also applicable to other useful purposes. Dec. 19; six months.

John White, of Manchester, engineer, for certain improvements in apparatus usually employed in lathes for turning metals and other substances. Dec. 19; six months.

James Berington, of Winckworth-place, Saint Leonards, Shoreditch, gent., and Nicholas Richards, of Cammomile-street, London, builder, for certain improvements in curing, or preventing smokey chimneys, which improvements are also applicable to the purposes of ventilation. Dec. 19; six months.

Christopher Nickels, of Guildford-street, Lambeth, Surry, gent., and Henry George Collins, of Queen-street, Cheapside, London, bookbinder, for improvements in bookbinding, parts of which improvements are applicable to the cutting paper for other purposes. Dec. 19; six months.

John Robertson, Jun., formerly of Tweedmouth, Berwick, now of Great Charles-street, Buckingham-gate, Middlesex, gent., for improvements of architecture, as regards its construction, or in the description or properties of the forms and combinations; and also of the superficial figures which may be employed; the application of these improvements or of the principles or method thereof being also for supplying forms, figures, or patterns in various arts or manufactures; also for an improvement or improvements with regard to the surfaces of buildings, whether interior or exterior, for protecting them from decay, and also giving them a more finished appearance. Dec. 19; six months.

William Henry Pitcher, of the West India Dock-house, Billiter-square, Middlesex, merchant, for improvements in the construction of docks and apparatus for repairing ships and vessels. Dec. 19; six months.

Neale Clay, of West Bromwich, Stafford, manufacturing chemist, for improvements in the manufacture of iron. Dec. 19; six months.

William Sandford Hall, of Stratheanr-cottage, Chelsea, Lieutenant in the Army, for improvements in paddle wheels. Dec. 19; six months.

William Henry James, of Birmingham, civil engineer, for certain improvements in telegraphic apparatus, and in the means of communicating intelligence by signals. Dec. 22; six months.

Charles Button, of Holborn-bars, chemist, and Harrison Grey Dyar, of Mortimer-street, Cavendish-square, gent., for improvements in the manufacture of white lead. Dec. 23; six months.

William Brindley, of Birmingham, patent paper tray manufacturer, for improvements in the construction of presses. Dec. 23; six months.

William Losh, of Benton-hall, Northumberland, Esq., for improvements in decomposing muriate of soda, (common salt), parts of which improvements are also applicable to the condensing vapours of other processes. Dec. 23; six months.

Jehiel Frankling Norton, of Manchester, merchant, for certain improvements on stoves or furnaces, being a communication from a foreigner residing abroad. Dec. 23; six months.

John Elvey, of the city of Canterbury, Kent, millwright, for improvements in paddle wheels. Dec. 23; six months.

LIST OF SCOTCH PATENTS GRANTED BETWEEN 22D NOVEMBER, 1837, AND THE 22D DECEMBER INCLUSIVE.

John George Bodmer, of Bolton-le-Moors, Lancaster, civil engineer, for certain improvements in machinery for spinning and doubling cotton, wool, silk, flax, and other fibrous materials. Sealed Nov. 24, 1837.

Richard Burch, of Heywood, Lancaster, engineer, for certain improvements in manufacturing gas from coal. Nov. 24.

Moses Poole, of Lincoln's-inn, Middlesex, gent., in consequence of a communication made to him

by a foreigner residing abroad, for improvements in looms for weaving figured and ornamented fabrics. Nov. 30.

Samuel Draper, of Basford, Nottingham, lacemaker, for certain improvements for producing ornamented lace or weavings, Nov. 30.

Christopher Nickels, of Guilford-street, Lambeth, Surrey, gent., for improvements in embossing or impressing the surfaces of leather and other substances applicable to various purposes. Nov. 30.

Joseph Lockett, of Manchester, Lancaster, engraver, in consequence of a communication made to him by a foreigner residing abroad, for certain improvements in the art of printing calicoes and other fabrics of cotton, silk, wool, paper, or linen, separately or intermixed. Dec. 1.

William Wilkinson, of Lucas-street, St. George's in the East, Middlesex, engineer, for a certain improvement or certain improvements in the mechanism or machinery, by which steam power is applied to give motion to ships or other floating vessels in or through water. Dec. 4.

Henry Blundell, of Hall, York, paint and colour manufacturer, in consequence of a communication by a foreigner residing abroad, for an improved method of operating upon certain vegetable and animal substances, in the process of manufacturing candles therefrom, and the application of certain products resulting from this method to various useful purposes. Dec. 7.

John Hall, of New Ratford, Nottingham, lace-manufacturer, for certain improvements in machinery, whereby cloth and other woven fabrics of various kinds may be extended or stretched, and dried in an extended state. Dec. 7.

John Upton, of Horsleydown-lane, Surrey, engineer, for an improved method or methods of generating steam power, and applying the same to ploughing, harrowing, and other agricultural purposes, which method or methods is or are also applicable to other purposes to which the power of steam is or may be applied. Dec. 8.

William Herapath, of Bristol, Somerset, philosophical chemist, and James Fitchew Cox, of the same place, tanner, for certain improvement or improvements in the process of tanning. Dec. 8.

Joshua Taylor Beale, of Church-lane, Whitechapel, Middlesex, engineer, for certain improvements and additions to his former invention, known by the title of a "Lamp applicable to the burning of substances not hitherto "sually burned in such vessels or apparatuses," and secured to him by Letters Patent, bearing date at Westminster, the fourth day of January, in the fourth year of the reign of his late Majesty King William the Fourth. Dec. 11.

William Fothergill Cook, of Breeds-place, Hastings, Sussex, Esq., and Charles Wheatstone, of Conduit-street, Hanover-square, Middlesex, Esq., for improvements in giving signals and sounding alarums at distant places by means of electric currents, transmitted through metallic circuits. Dec. 12.

James Leonard Clement Thomas, of Covent-garden, Middlesex, Esq., in consequence of a communication from a foreigner residing abroad, for an improvement applicable to steam-engines and steam-generators, having for its object economy of fuel. Dec. 20.

Thomas Joyce, of Clerkenwell, New Road, Surrey, gardener, for improved apparatus for heating churches, warehouses, shops, factories, h carriages, and other places requiring artif and improved fuel to be used therewith.

NOTES AND NOTICES.

Bridge at Pesth.—The estimation in wh lish engineers are held abroad has been manifested in a remarkable manner, by t ness shown to obtain their opinion on the undertaking of constructing a bridge Danube, between Pesth and Often, the Lo Southwark of Hungary. Two great co houses, that of Sina, at Vienna, and Wodianer and Son at Pesth, have been i contract on this occasion, and each of summoned an English engineer to its aid. these, Mr. Clarke, of London, has already l the other, Sir John Rennie, is speedily there. The German papers announce hin readers as one of the first of English engi a practical man the very first,—whose na English scientific journals and cyclopædia as a star of the first magnitude; a man wh recent creations (Schopfungen) in hydrau tecture, and especially by the magnific amazement-exciting New London Brid almost earned himself a name and fam history of the world.—*Railway Times.*

Cleaning Windows.—The best and most method of cleaning windows, looking-glass stated by M. Fromont, a French philosoph first, to wash the window, and then, wl nearly dry, to rub it with blotting-paper.

Rival to St. Pauls.—Three thousand are at present employed on the Great Church," as it is called, of St. Petersburgh centre of the city, near the Admiralty, on t of the Neva. This gigantic building wil English feet high, or only twelve feet lo St. Pauls. The exterior will be ornamen 112 pillars, each one solid block of red gra with four bas-reliefs on the four pedime 112 feet long. The marble dome is 109 fe meter, and on each side of it is a clock-tur the main boast of the edifice is in the tw columns which support the cupola, each feet high, and each of one block of marble inexhaustible quarries of Finland, which the materials for the other two great orna capital—the rocky pedestal to the statue the Great, and the Alexandrine column. these twenty-four pillars weighs 200,000 and each is at an elevation of 200 feet in The church will be the third largest in Eu It is singular that each of the the three will cated to a different form of Christian wors Peter's to the Roman Catholic service, St. the Protestant, and this to that of the Greek The prototype of them all, St. Sophia, at tinople, remains a mosque.

New Route to Paris.—The speculator channel are quite as sharply on the look-ou can be here. A few years ago, the only regu to Paris from London was via Calais. Boul now half-usurped its place, Dieppe puts in for a share, and Havre secures a portion Bull's patronage. In addition to these a n petitor has just appeared,—St. Vallery, estuary of the Somme, whence William t queror embarked for England.

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Mechanics' Magazine,

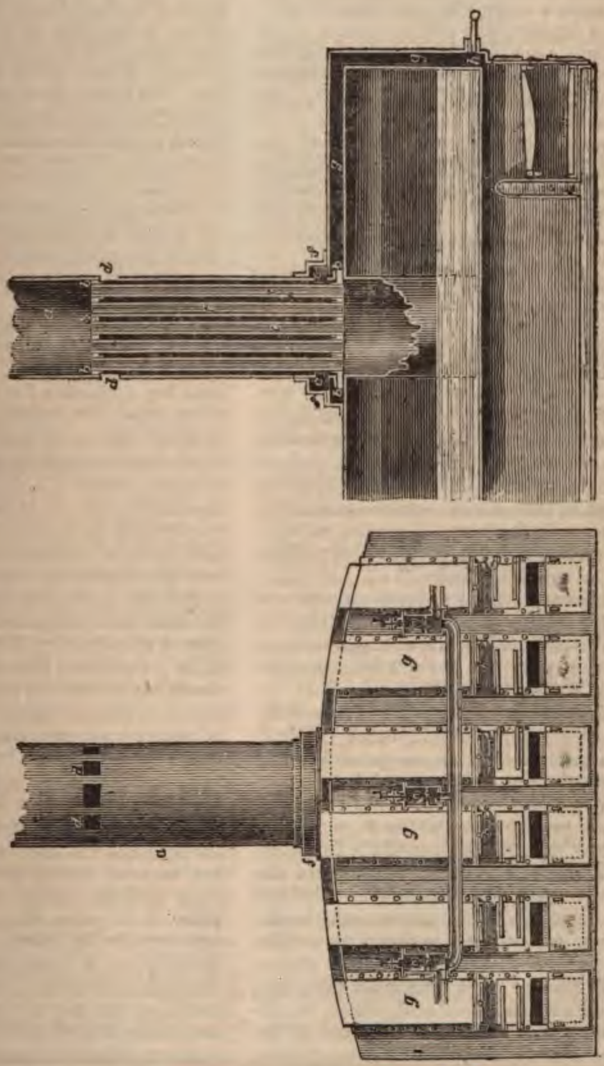
MUSEUM, REGISTER, JOURNAL, AND GAZETTE.

No. 752.] SATURDAY, JANUARY 6, 1838. [Price 3d.

MR. SAMUEL HALL'S SMOKE-CONSUMING FURNACE.

Fig. 1

Fig. 2



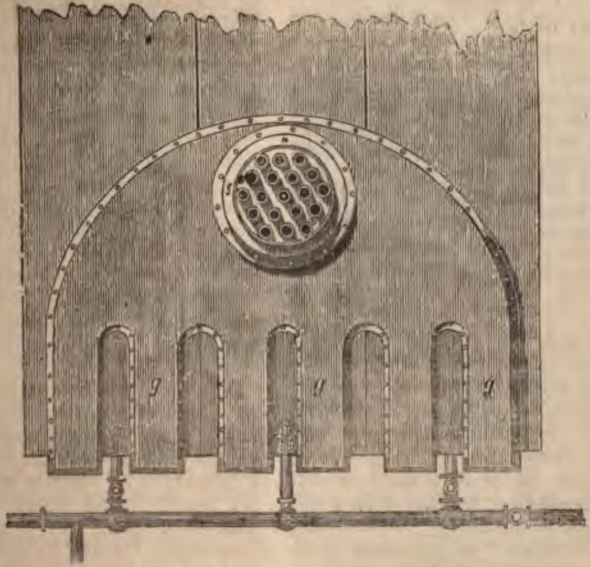
MR. S. HALL'S SMOKE-CONSUMING FURNACE.

The loss of fuel which occurs in the ordinary methods of combustion in steam engine and other furnaces, is very considerable, a great quantity of inflammable gases, &c., evolved from the coal, &c., being allowed to escape up the chimney without being consumed. For instance, a charge of coal being thrown into a furnace, one portion comes in immediate contact with the already incandescent fuel, and is instantly decomposed, the gases passing off into the roof of the furnace, the temperature of which is lowered by the upper portion of the charge of coals to a degree not sufficient to consume such gases, &c., so swiftly as they are formed. Thus the great loss of combustible material arises, which is evidenced in the dense smoke accasionally issuing from the chimneys of steam engine, and other furnaces; a two-fold evil here exists, the loss of fuel, and the nuisance of the smoke. Mr. Samuel Hall has invented "an apparatus to effect the combustion of fuel more perfectly than has hitherto been done by reducing (if not altogether preventing) the escape of inflammable gases, carbon, or other combustible matters, up the chimnies of steam engine and other furnaces in the form of smoke, or without undergoing the processes of inflammation and combustion."

This apparatus introduces a quantity of heated atmospheric air at the entrance of the fire-place (when it is a long fire-place), for it to pass over the fire from one end to the other, to inflame and effect the combustion of any unignited inflammable gases, carbon, and other combustible matters as they are generated and liberated from the fuel and before they arrive in the form of smoke at the chimney, or perhaps even at the flues leading thereto, or at the bridges of the furnaces; at the same time, by the adoption of this improvement, the quantity of air admitted into the ash-pit and underneath the fire may be reduced; for as the oxygen of the atmosphere that is introduced underneath the fire is for the most part converted into carbonic acid, which is calculated to extinguish the flame of inflammable matters, instead of supporting their combustion, no more air should be admitted underneath the fuel than is found necessary, but as much heated air should be passed above it as can be used to advantage. In an engine which Mr. Hall has experimented with, of ten horse power, which had an opening into the ash-pit underneath the fire bars of three feet three inches wide and twelve inches deep, equal to four hundred and sixty-eight square inches, it was reduced to one-third of that area; experience, however, will show the most proper quantities of air to be introduced below the fuel which is easily regulated by any suitable means. When the fire-place is not a long one (as in locomotive engine and other similar boilers), the heated air is introduced all round the fire, or at as many sides of the fire-place as is convenient.

The supply of heated air is obtained by means of applying the heat of the flame or gases which escape up the chimney, to increase the temperature of a quantity of air which is introduced into the fire-place and above the fire; the manner of doing this is shown by the drawings. Figures 1, 2, and 3, represent the apparatus for supplying heated air as applied to a marine steam engine boiler; figure 1 being a longitudinal section of the apparatus and a portion of a boiler; figure 2 a front elevation, and figure 3 a plan. *a*, is the chimney—*b*, *b*, are two plates of cast iron or other suitable material inserted in the chimney at any convenient distance apart, which is regulated by the length of the pipes *c*, *c*, as hereafter described; they may be placed at a distance of ten feet from each other; the lower plate should be as low down in the chimney as can conveniently be. *c*, *c*, are are a series of metallic pipes of any convenient diameter, say from seven to nine inches; they are open at each end and are inserted into holes in the plates *b*, *b*, and are supported in their situation by angle irons. *d*, *d*, are apertures in the circumference of the chimney as near as may be to the top of the pipes and the under side of the upper plate *b*, *b*. *e*, *e*, figure 1, are similar apertures in the chimney just above the lower plate *b*, *b*, which open into and communicate with a casing *f*, *f*, surrounding the foot of the chimney. *g*, *g*, are channels leading from the casing *f*, *f*, to the apertures *h*, *h*, in the front of the fire-place, and above the fire doors. The external atmospheric air enters at the apertures d, d, and passes down the

Fig. 3



ney on the outside of the pipes *c, c,* then passes out at the apertures *e, e,* the casing *f, f,* and from thence g the channels *g, g,* to the apertures ; thus the air by its passage over heated surface of the tubes *c, c,* of the top and front of the boiler mes considerably heated, so as to r the fire-places at *h, h,* in front of fire, at a temperature sufficiently ted to cause by its passage over the the ignition and combustion of the ter part, if not the whole, of the com-ible matter which usually passes off e chimney in the form of smoke.

the air by descending in contact the chimney be heated beyond the perature of the steam within the r, a portion of heat will be given out he air to the boiler during its passage g it to the fire-place; but if the air ot heated to the temperature of the n, then the boiler will give out a por-of heat to the air, and cause it to be ufficient temperature to effect the ct intended. In some cases the bustion of the smoke may be effected he heat derived by the air passing the boiler only, and this process is *ttended with so great a disadvantage ght be supposed, for the heat taken the top of the boiler is* restored underneath it, to which will be added the heat arising from the more complete combustion of the inflammable gases and other matters constituting smoke; where, therefore, other means of heating the air cannot be conveniently adopted, this will be found a process capable of effecting the combustion of smoke.

Mr. Hall remarks in the specification of his patent, that attempts of various kinds have been made (for some of which patents have been obtained) to effect more perfectly the combustion of the fuel and of the smoke arising therefrom in the fires of steam boilers. In the first place, attempts have been made by introducing heated air in at the bridge or entrance of the flues leading to the chimney, and consequently beyond the fire, such air being heated by a separate fire, or by the furnace itself, or by flues of the boiler.—Secondly, similar attempts have been made by introducing heated air at the bridge and beyond the fire, such air being heated by causing it to pass through the insides of tortuous or bent pipes placed within the chimney, or in a chamber leading thereto, the air being forced through them by blowing machinery, or by the draft of the fire through such tortuous or bent pipes; or the air to be heated is drawn up among

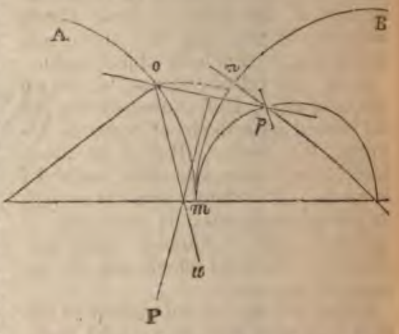
a series of pipes, and down from them through a large centrical main pipe. Other attempts have been made by passing air by blowing machinery through an extensive system of zig-zag passages, interspersed with immediate zig-zag smoke passages, through which latter the heated gases from the furnaces are also passed by blowing apparatus to heat such air in the air passages, which heated air is sent underneath the fire into a closed ash-pit. Tortuous and zig-zag passages for the air to pass through and be heated, Mr. Hall considers as injurious, and that the object of more perfect combustion is more surely effected by the method he adopts, in which, the atmospheric air which is to be heated, enters the casing containing the pipes, and proceeds over them in one straight forward direction, without taking one or more zig-zag courses; for any changes in the direction of the current of air will prevent so ample a supply thereof as is attained by the straight-forward direction, unless the assistance of a blowing apparatus or other mechanical means be resorted to.

METHOD OF SETTING OUT THE TEETH OF WHEELS FOR MILLWORK.

Sir,—It is well known that the form commonly given to the teeth of wheels, is that of a radial line within the primitive circle, or what is technically called the "pitch line," and a curve outside of that line; which curve ought to be part of an epicycloid generated by a circle of *half* the diameter of one of the wheels, rolling on a circle of the same diameter as the primitive circle of the other, whose teeth are to be drawn. But from the trouble attendant upon drawing the epicycloidal curve upon each tooth, the curves are generally made circular.

There is an easy method of finding the proper curves for the teeth, which I have never seen either described or practised, except by myself, which I offer for the use of your readers.

The diameters of the wheels and size of their teeth are determined by the nature of the work they have to do, and are therefore known. I shall take an example of two wheels A and B of equal diameters, and suppose the curve of the teeth of A to be required. From three centres, on a straight line, draw the pitch lines touching each other, and a semicircle half the diameter of the pitch line of B, touching the pitch line of A and the centre of B.



From the centre of A, and with a radius equal to that of the ends of the teeth of A, intersect the semicircle at the point p.

Through the point p and the centre of B, draw a radial line, cutting the pitch line of B in the point n.

From the point m, where the pitch lines intersect the straight line, set off an arc $m\ o$, upon the pitch line of A equal to the arc $m\ n$.

Through $o\ p$ draw a straight line, and from the centre, between the points o and p, raise a perpendicular P.

Draw a straight line through the points $n\ m$ (this line is not shown in the engraving), and from the point where it cuts the perpendicular P, *whether that point is within or without the pitch line*, strike the curved part of the tooth, a portion of which is shown by the dotted line.

Persons acquainted with the properties of the epicycloid, will perceive that the points o and p are in that curve; and it may be demonstrated that the circular curve drawn as above directed, will pass within the epicycloidal curve between the points o and p.

Some workmen are very fond of what they call "dropping the line," or in all cases striking the teeth from a circle of centres smaller than the pitch line; whereas, in many cases, they should be struck from a larger circle. The only motive for this must be to take more off the points of the teeth, which object will be better attained by drawing a straight

through *o* and the point on P
is above, and with a diminished
striking the tooth from some
pon *o u;* but it is not advisable
ot this method generally, and
nore off the points of the work-
es of the teeth of those wheels
re drivers, than the above me-
rects, is decidedly objectionable.
n epicycloid cannot be drawn
mpasses, I of course do not put
ward as a mode of correctly de-
g the teeth. But it is much
correct than any other method I
n; is abundantly accurate enough
eral purposes; is very easy of
ion; and is founded upon ma-
cal principles which can be ex-
if necessary.
eel driving several pinions of dif-
liameters with epicycloidal teeth,
ose teeth are suited to the small-
ion, can only move that pinion
y on both sides of the line of
; the others will be moved up to
of centres, but beyond that line
ver will not touch them. They
wever, be sufficiently correct for
nary purposes.
few trifling difficulties may oc-
the application of the above
of striking out teeth to parti-
ases, which I may explain the
of surmounting, in another paper.

Your obedient servant,

C. G. JARVIS.

, 1837.

ESTING MACHINE, WOOLWICH.

essor Barlow has just published a
on the Strength of Materials,
composed of a new and enlarged im-
of his "Essay on the Strength
er," with the addition of an article
pension Bridges, and the reports
y the Professor to the Directors of
ndon and Birmingham Railway
ny, on the points connected with
struction of railways referred to
r investigation, in company with
. Rastrick and Wood,—which Re-
ere duly noticed in the *Mechanics'*
ne at the time of their first ap-
e. There is also an addition to
mer number of the plates, in the
of two well-executed engravings
testing machine for trying the
h of *iron, made use of in* the
Queen's dockyard at Woolwich. The Professor thus speaks of the original drawings from which these engravings were copied:—

"The drawings here referred to were made from a very accurate and well-executed model of this machine, contributed by an Egyptain youth, Mahomet Al Moonga, sent to this country by Mahomet Ali Pacha, for instructions as an engineer; he was placed under the tuition of Mr. John Kingstown, assistant engineer in his Majesty's Dock-yard, Woolwich, under whose able instructions he not only constructed this machine, but also other models and drawings, highly creditable to his industry and talents." —p. 55.

Professor Barlow might have added, that the individual of whom he speaks in these handsome terms, likewise displayed his talent for English composition, by the numerous contributions which appeared from his pen, during his residence in England, in the pages of the *Mechanics' Magazine;* at first, under the signature of "Mashdoud Mohandez," and afterwards under his real appellation of "Mohammed all Moonghee." We are happy to perceive, from the list of subscribers to the first volume of the Civil Engineers' Transactions, that our old correspondent is now established at Alexandria, we presume as engineer to the Pasha, and that he still retains that interest in the progress of practical science for which he distinguished himself when here.

PRESERVATION OF TIMBER.

Sir,—Allow me to make a few remarks on one or two articles that have recently appeared in the pages of your Magazine.

First, I beg leave to correct a mistake of Dr. Granville's, quoted from his interesting work on the Spas of Germany, by your able correspondent, Mr. Baddeley, in No. 735, with reference to the pickling of timber.

Dr. G. says, "it will be found on trial, that the bichloride of sodium in this respect, is as efficacious as the bichloride of mercury employed by Kyan." Here Dr. G. calls common salt by the name of bichloride of sodium. Why he does, I know not. I should not have expected such an egregious error from so eminent a physician, and wonder it was not noticed by the sharp-sighted Mr. B. Common salt is not a bichloride, but a

a *chloride* of sodium, as is well known to every chemist, as it consists of but one atom chlorine, and one sodium.

In No. 740, another correspondent (Old Oak), brings forward as an instance of the impracticability of applying a solution of chloride of sodium for the preservation of timber, the case of the "Princess Royal." Is he aware what was probably the cause of the failure? I believe it to have been this:—the salt that was chosen for preventing the decay of the timber of this vessel perhaps was of an inferior kind, in order to save expense. Now, chloride of sodium in its pure state will not deliquesce. The commoner kinds contain a great quantity of magnesia, which causes them, when exposed to the action of the atmosphere, to attract moisture and become damp and wet. If a salt of this kind was used, it would cause all the bad effects mentioned by him. From the few observations I have been able to make, I firmly believe that a solution of pure chloride of sodium will effect all that Dr. G. ascribes to it.

Your talented correspondent (F. Maceroni), in No. 743, makes some remarks on this subject. With that gentleman's views, I perfectly coincide, and beg to add, that some years since, the idea that sugar of lead would preserve vegetable fibre occurred to me, from noticing how well it kept common paste from becoming sour, &c. Some experiments I have subsequently made, have confirmed my opinion, and I think that should a company ever be formed and experiments carried on, on a large scale, either the chloride of sodium, or the acetate of lead, would be found quite able to compete with oxymuriate of mercury, on account of the cheapness of the former when compared with the latter.

Trusting these few observations will not prove inopportune,

I am, Mr. Editor,
Your's truly,
JOHN FORDRED.

Near Sheffield, Dec. 29th, 1837.

GOWLAND'S ARTIFICIAL HORIZON.

Sir,—On reference to Barlow's Mathematical Dictionary, I find a suggestion for a floating speculum horizon, as stated by "Nautilus" at page 131, and I beg to *thank him for his* information. Although *I was wrong* therefore in attributing its *original invention* to Mr. Gowland, I fancy I may claim for him the merit of having perfected the original crude idea, without fear of contradiction. In making a practical application of the original suggestion, many points of great nicety had to be taken into account, and the skilful manner in which Mr. Gowland has accomplished the object in view, is highly creditable to his talent. Instead of "several pounds" of mercury being employed, a few ounces has been made sufficient for the purpose; the *speculum* employed is a circular plate of homogeneous black glass, the two surfaces of which are rendered perfectly parallel. The small circular box, containing the whole complete, is made with great accuracy, so that the instrument becomes an universal level of considerable value, indicating at once the conformity, or points of deviation from the true horizon of any surface upon which it may be placed.

When the simplicity, economy, portability and complete efficiency of Mr. Gowland's artificial horizon, as described at page 433, of your last volume, are taken into consideration, I think it is not surpassed by any instrument of a similar kind extant.

I am, Sir,
Your's respectfully,
WM. BADDELEY.

London, Dec. 22, 1837.

ANOTHER METOD OF PROFILE TURNING.

SIR,—There is another method of turning profiles in the lathe, besides that described by your correspondent Mr. Hitchins, in number 748; which, by giving a place in your valuable Magazine,

erve for the amusement of amateur s. It is not new, but may be so ıy. The above sketch will explain Heads thus turned may answer for ps of walking sticks or umbrellas: held up between a candle and the the shadow will give the profile ce according to the relative dis- of the wall and candle from the .

I am, Sir,
Your's obediently,
A. M'G.

AVERY'S STEAM-ENGINE.

ing requested a friend in Edin- to give us some intelligence as to vas actually being done there with s Rotary Steam-engine, we were ed with a reply, dated the 21st of ber, from which the following is act:

alled on Mr. Ruthven a few days he is fitting up an extensive shop l sorts of machinery, including a nmer; all to be worked by the engine, and he seems quite con- that the one he has erected will him with 15-horse power, at an ely low expenditure of fuel. At it has only a few turning lathes, planing machine, and grindstone k, taking, perhaps, from two to horse power. He says the con- on is only two shillings a day in He has two engines in hand to the one for pumping in England, other for the same purpose in nd he received two orders for en- to work thrashing machines the g I was there, which looks as if obtained confidence amongst the t of our canny countrymen. In- s guarantees as to work and econ- upposing them sufficiently sup- are most satisfactory. The re- wheel, or rather arm, is placed ly within a sheet iron case, which tely conceals it; it may be about meter of an ordinary large coach the two emission holes, having nderstood Mr. R.) a 20th of an ea; and the arm making 3000 re- ns per minute. The strap which he power off the prolongation of (which is about 4 inches diame- f extra breadth, *perhaps* 14 inches, and as it leads to a large drum at a short distance, I should be very apprehensive of its working well when the full demands are made on it; at present it works well. However, the thing must now soon be effectually tested; in the mean time, it is plain, as well from the high respectability of Mr. R.'s character, as from the steps he is taking, that he at least is sincere in the matter."

NEW PAVING COMPOSITION IN PARIS.

Several thoroughfares in Paris have lately been paved with a composition of pitch, gravel, &c. The ground, having been levelled, is covered with about three inches of concrete; again levelled and covered with a mixture of small black pebbles from sea sand, about the size of currants, in melted pitch. The composition is manufactured on the spot, in portable furnaces and melting pots, labourers continually stirring it. The fine square (the Place de la Concorde) in the centre of which stands the Obelisk of Luxor, has been paved in this manner, beautifully tesselated in black and white, with a border of red granite. The black is the natural colour of the stuff; the white compartments are made by strewing rough sand on the surface of the composition before it hardens; and any colour might be given to it in a similar manner. The appearance, when finished, is very much that of various coloured granites. It makes a beautiful, hard, firm and level pavement; and it only remains to see how it will last. For a foot pavement we think it will answer very well—but we fear that for carriage traffic it will prove a failure. A somewhat similar plan was tried on the Vauxhall Road some years ago, and also in the Whitechapel Road—but in both instances it has been abandoned, and the old macadamising system restored. The foot pavement on the Pont Neuf has been laid for two years, and we understand that it is still in excellent condition. Some days ago the carriage pavement at the entrance of the Champs Elysées, where the substance had been laid down a fortnight previously, was tried for the first time. The first carriages that passed, were those of the royal family, on their way to Neuilly, and immediately afterwards the post was opened to public circulation. Since then an

immense number of vehicles of every description, besides horsemen at full speed, have gone over the spot in question; the draft of the carriages is much lessened, and they run without the stunning noise which invariably takes place over stone pavements.

BELL'S IMPROVEMENTS IN HEATING AND EVAPORATING.

Sir,—Your correspondent, Mr. Bell, will materially benefit the readers of your valuable Magazine, if he would state, through the channel of your pages, the experiments, and the manner in which they were conducted, that have led him to the conclusion, that "air heated to a high degree, forced by blowing through the fluid, in tubes or otherwise, *unmixed with the products of the fire, and under a controlling power different from, and independant of the flue draft,*" is productive of so many important results, both as regards durability and economy, as he asserts. And whether the opinion quoted from "a chemist of great celebrity" (Dr. Fife) was formed from the result of the experiments conducted by Mr. Bell.

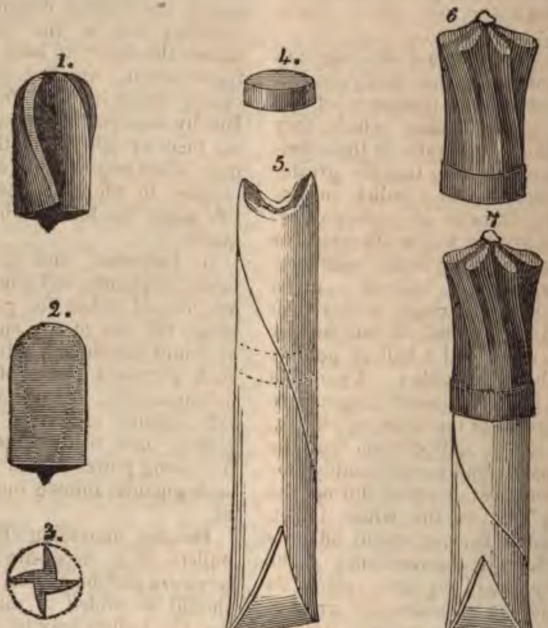
I am, Sir, your obedient servant,

W. GYFFORD.

Birmingham, Dec. 28, 1837.

SPIRAL BULLETS AND CANNON SHOT.

(Being No. 1, of a series of Papers by Colonel Maceroni, laid before the Ordnance, &c., in 1826-7.)



As the correct range of a rifle ball depends upon its rotation on the axis of its flight, it is evident that if a rotation similar to that produced by the spiral grooves of the rifled barrel could be given to the ball by any other means, the effect would be similar and equivalent. It is, therefore, one and the same thing, whether the projectile obtain the desired rotation from the grooves of the barrel, or whether, like a well feathered arrow, it derives it from the action of the air through which it subsequently passes. And, indeed, supposing other necessary

ions to be obtained, the latter s of rotation will, as I am about ow, present advantages over the r. For instance, the rotation of le bullet has a continued and in- ng tendency to diminution from ry commencement of its exit from arrel; so that we find it die away ther before the termination of long , which leaves the ball to deviate the proper line of flight. It is true his defect may be diminished by sing the depth of the grooves, and igth of the barrel; but this involves convenience of requiring more force, and trouble, to drive the bullet s place.

the case of my spiral bullet, which s its rotation from the atmosphere d of from the barrel of the piece, h exhaustion of the rotative motion s; because that motion is of neces- ontinued as long as the bullet through the air which causes

ce the velocities and the ranges of ted bodies are principally limited egulated by the resistance of the phere to the surface which they it, in the inverse ratio to their den- r mass,—it follows that the greater ensity or mass of a bullet, in pro- n to its diameter or surface of re- ce, the greater will be its range, or of overcoming such resistance. e it is, that a ball of a given ter of iron will range further than of marble; a ball of lead further one of iron; and a ball of gold or a further than either. Upon this ple, it has often been imagined to ruct bullets of the shape of an egg, pear, in the supposition that the r or heavier end would steadily pre- the foremost position during the ; and that as the whole bullet, igh much heavier, would offer no superficies to the resistance of the an a sphere of the same calibre, its would be considerably greater. idea occurred to me also twenty ago; but although it was original as my knowledge was concerned, n after found that it was by no s new. Whether old or new, ex- ice, however, proves it to be only lly correct, at least in horizontal s: for the eggshaped bullet, upon it from *a smooth barrelled* musquet, does not preserve its proper position, but often whirls over and over during so great a portion of its flight, as to increase instead of diminish the surface of resis- tence, by which its range is not only curtailed, but considerably disordered. By placing such a shaped *shell* in a countersunk cylindrical " bottom" of wood, this defect might perhaps be remedied.

No irregularities can possibly occur in the flight of my spiral bullets; cannon shot, or shells, although they possess the advantages of *extended range* and in- creased momentum, hitherto but par- tially obtained, at least in horizontal firing, by the spheroidal and other elon- gated configurations which have been often recommended.

Rifles are applicable to no other pur- pose but that of shooting with *ball;* for we shall find that upon attempting to fire buck-shot, or bird-shot, from such pieces, the rotation communicated to the wadding and to the charge of shot, causes the latter to issue with a centri- fugal motion, which disperses it imme- diately upon its exit from the barrel. But by means of the spiral bullet, a fowl- ing piece or other smooth-barrelled gun may, when required, be applied to every purpose to which the best and heaviest rifle alone has hitherto been found ade- quate.

In Indostan, and in Africa, where tigers, elephants, and other large animals, are hunted either for profit or amuse- ment, the use of my spiral bullets will be found particularly advantageous. For such purposes, pieces of large bore are indispensable; as bullets of the ordinary rifle calibre, of sixteen to thirty to the pound, have neither the penetrating or fracturing power which the attacker of such gigantic animals ought to be master of.

Besides increasing the size of the bullets, it is necessary that for such service, a portion of zinc, tin, or bismuth, should be added to the lead, in order that the bullets may be less liable to be flattened against the thick skulls, bones, or hides they have to encounter; and as precision of aim in such contests is of the very first importance to the biped party, it is usual for the latter to use a rifle. It is allowed that a large bore is indispensable; but the larger the bore of a rifle the deeper must be the grooves of

the barrel, and consequently the greater the force required to drive home the ball.* And balls duly hardened for the purpose we are speaking of, cannot be forced down a rifle at all. But by the adoption of my spiral bullet, advantages over and above such as belong to the rifle are obtained, and every disadvantage or inconvenience done away with. In the first place, pieces of the calibre of eight, six or four balls to the pound are used with all the ease and expedition in the loading of the common musquet, and at the same time project their bullet with *as much* precision, and *more* power, than the best rifle. The bullets on my spiral principle may not only be of hard zinc, but of cast iron even, and yet they will be heavier than a spherical leaden bullet of the same calibre;—moreover, these bullets are fired from *smooth-barrelled* pieces, with which we may also use bird-shot, or buck-shot, at pleasure, which cannot be done with a rifle.

It may be imagined by some that a projectile which is double the weight of a spherical one of equal diameter, will occasion an unpleasant recoil of the piece. To this I reply, that such objectors may satisfy themselves of their mistake, by firing two balls at once out of their rifle or fowling piece; or by weighing the ordinary charge of bird-shot, that they use in the latter, which they will find to amount to nearly double the weight of the bullet that fits it. For military purposes the spiral bullet may be of the same weight as the spherical one, in order not to charge the man with an extra load; but for shooting such large animals as above spoken of, I recommend it to be double the weight of the sphere, and either of zinc or cast-iron. The direction of the flight of bullets, cannon-shot, and shells, becomes less and less liable to deflections in proportion as their dimensions increase; because the larger the sphere, the less is its surface and irregularity of shape, in proportion to its mass. For example, I have measured bullets of sixteen to the pound, and found an irregularity of shape amounting to one-sixteenth of an inch; and I have also measured some twenty-four pounder shot, in which the spheroidal deviation did not amount to quite so much. Now, a twenty-four pound shot weighs 384 ounces; so that in the one ounce bullet the irregularity was as 384 to 1, as regards the respective masses, and as 10 to 1 in reference to the diameters. Hence the advantage to be gained by the use of rifled *cannon*, even supposing such an adaptation were practicable, would not be commensurate to the smallest sacrifice of expense, time, or convenience. Experience also shews us that the precision with which artillery, *properly loaded*, can be directed, is quite sufficient for every ordinary purpose.

As we descend, however, to the smaller calibres for field, or rather *mountain service*, we find the proportions of the surfaces resisted by the air greatly to predominate over the masses; so that the irregularities in the spherosities, and the consequent irregularities of range, as well as the resistance of the air, progressively increase with the diminution of the calibres.

From the time of Mr. Benjamin Robins, and even previously, it has often been attempted to construct one, two, or three pounders on the rifle principle, but without success. In rifles of large bore, as I have said above, unless the grooves are of proportionate depth, the ball tears out of them without receiving a sufficient rotary motion. In three, two, or perhaps even in one pounder guns, the grooves would be of such a depth, as to make it very inconvenient to load even with leaden balls. The iron ones cased with lead, and those with leaden knobs to fit into the grooves of the piece, have been given up. I, however, submit, that it would add to the efficiency of mountain guns, if with such pieces my spiral bullets were to be employed, as both their range and precision would be increased.*

For battering in breach, which is the only service in which there is any plea

* In rifles of large bore unless the grooves are of proportionate depth, the ball tears out of them without receiving a sufficient rotary motion, and *with strong charges for long ranges*, it will happen *with most rifles. Some plan might be devised for casting rifle balls with ribs to fit into the grooves of the rifles. I have seen* and tried several such, *which all have some objection.*

* I object *in toto* to the use of such pieces in the field; rockets or long howitzers to throw shells horizontally would on all occasions be ten times more efficient than solid shot. Hollow projectiles even of the field gun calibres, will have in the first instance all the effects of solid shot, *besides their subsequent explosion*. It also very much disconcerts troops to see hollow projectiles rolling in amongst them, with fuses burning, and expected every instant to burst.

ing solid shot balls, my spiral shot a 24-pounder, will possess the ating and breaching effect of a under, with increased precision of If, however, the breaching bat- are placed as they usually are, regular approach, upon the crown- the covered way, I am aware that long shot mentioned by Sir Howard as, or any other oblong spheroid, t *short distance* answer very well, e same may be predicated of *close* s at sea.

n not exactly prepared to say what be the effect of hollow *spherical* tiles fired horizontally against faced with *marble*, or *similar very tone*, but this I can show, that fired orks of brick, not to speak of earth, netration of the *spiral* shells is or to that of solid shot; while their uent explosion causes an effect r beyond all comparison; for each tile acting as a mine, a very few s only, form a practicable breach. hell (a 24-pounder only,) has been o make an excavation of thirty feet!*

this subject however, I have written rate paper, containing all the offi- oofs and experiments I have been o meet with, more especially as s the defence of places, in which ieged have to combat no other than of earth and timber. That on such ons solid shot should ever be used her remarkable instance of official ment to routine and custom, in tion to positive knowledge, and idence of the senses!

FRANCIS MACERONI.

planation of Engraving.—Fig. 1. piral bullet with four ribs.

2. Longitudinal section of the the dotted lines showing the eleva- the ribs or spiral wings.

3. Transverse section of the base bullet.

4. Indispensible wad, or bottom k, wood, or metal, to be placed n the spiral bullet and the powder.

Fig. 5. Cartridge with wooden bottom rolled up in the paper case, as directed for buck-shot cartridges.

Fig. 6. Better method for leisure shooting of spiral bullets in cotton, with a greased cork bottom attached to it.

Fig. 7. Cartridge formed by attaching the above cotton envelope, to a paper case of powder.

N. B. Paper cases should be folded instead of tied. I place a metallic wad over the cork or wooden one.

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* the course of experiments made in Prussia, Scharnhorst, four 6 inch, and twenty-two shells were fired into a rampart twenty feet These few shells of such feeble calibres *to make a breach twenty-four feet wide at , and practicable even for cavalry.* How *ores of solid shot would have slept peace- ed in such a rampart!*

SIR HUMPHRY DAVY'S PRESIDENCY OF THE ROYAL SOCIETY, AND MR. JOHN HERAPATH—PHILO-DAVY IN CONTINUATION.

Sir,—In my last letter inserted in your journal for August last, I brought down the analysis of "the Private Correspondence which (is absurdly said to have) ended in the exit, expulsion, or forced retirement of Sir Humphry Davy from the Presidency of the Royal Society," to the communication by Herapath to the president of certain "experiments on temperature," which appearing to Sir Humphry to be of the class of impossible experiments, inspired him with a contempt for the relater of them, which he did not strive to conceal. The point, the reader may remember, on which Sir Humphry Davy's incredulity turned, was, that Mr. Herapath had spoken of "mixing mercury in vessels of hammered tin, *a metal which is rapidly dissolved by mercury*." Mr. Herapath has now published a paper, entitled "Some experiments on temperature, with a view to determine the ratio of temperature, and the point of absolute cold," which paper, he says, "is *the paper* referred to in the Davy Letters." The *genuineness* of this paper is, of course, the first thing to be looked at, for if it be not actually "*the* paper"—the identical paper, ungarbled and unchanged, which was submitted to Sir Humphry Davy—and "referred to in the Davy Letters," then it is not worth while wasting a word upon it—my business being less with the man's theory and his experiments (tempting enough though they be, from their extreme absurdity), than to vindicate the memory of the illustrious Davy from what I believe to be a gross slander. Now the paper which

has been just published by Herapath as "*the* paper," contains intrinsic evidence of an interpolation on the material point at issue, which shows that it is not the genuine document, but something else which he has published for his present purpose; and which is, therefore, of no authority whatever. In the original paper as quoted by Sir Humphry Davy *at the time* Herapath spoke of mixing mercury at high temperatures, "in vessels of *hammered tin*;" and Herapath did not *at the time* dispute the correctness of Sir Humphry's quotation; but in what he has published after the lapse of sixteen years as "*the* paper," the words "vessels of hammered tin" do not once appear. His story now is this: One portion (of mercury) at a temperature of 670°, I put in a vessel standing on three *tin* legs, beaten out of a piece of block tin, something in the form of a hemisphere, and capable of holding about a hundred ounces of mercury. The *tin of this vessel had been melted from the iron by previously making it red hot.* IN A SIMILAR VESSEL I raised the other part of the mercury to a temperature of 480°." It is clear that no such words as these could have been in the original paper; else why the surprise expressed by Sir Humphry Davy, that Herapath should have spoken of mixing (or boiling) mercury in "vessels of hammered tin—a metal which is rapidly dissolved by mercury.?" The removal of the tin from the iron by a preliminary melting process, looks amazingly like an *after thought*, hit upon for the sake of saving the experimenter's character for honesty and consistency. Be this as it may, it is sufficient for our present purpose, that the account which Herapath now gives of his experiments, is not *the* account which he submitted to Sir Humphry Davy, and upon which Sir Humphry grounded his disbelief in these experiments. I have shown it to be, in one important particular, undeniably spurious, and if the original has been altered in one part, what security have we that it may not have been altered in others? The maxim of the law applies here with irresistible force—*Falsum in unum, falsum in omnibus.*

I am, Sir,

Your obedient servant,

PHILO-DAVY.

Camden Hill, Jan. 1, 1838.

SOCIETY OF ARTS.

The Society of Arts, in years gone by, took a prominent part in the scientific world, and effected considerable good in promoting that spirit of invention and discovery which is now so general amongst the manufacturing community. It has not however, kept pace with the times, and has of late years fallen into obscurity. It has also fallen into debt, and an appeal has been lately made to its members, urging them to procure donations and annual subscriptions from noble and wealthy patrons of the arts, manufactures, and commerce of the country, and to obtain an increase of members so as to "renovate the funds and extend the useful powers of the society."

In the address issued by A. Aiken, Esq. Secretary, the following sketch of the history of the Society is given:—

In the year 1754, when this Society was founded, there existed absolutely no Institutions in the country for the purpose of encouraging the application of science to the improvement of the practical arts, or to extend to the arts of design that patronage without which they languish and decay. By the generous personal exertions of Mr. William Shipley, of the then Earl of Romney, and of Viscount Folkstone, the Society of Arts was established, and in the first twenty-eight years of its existence was enabled to expend on the various laudable objects which it had in view, about a thousand pounds annually. Of this sum no less than 8183*l.* was bestowed in honorary medals and large pecuniary premiums to painters, sculptors, and engravers, previous to the creation of the Royal Academy; and the gratuitous use of the Society's Great Room was allowed for some of the first annual exhibitions of the works of English artists.

In carpet weaving and quilting in the loom, the Society had the satisfaction of introducing and securing to the country various improvements, and some entirely new branches of manufacture, by the judicious outlay of not more than 1500*l.*

The supply of fish by land carriage to London, from the fishing stations on the coast of Kent and Sussex originated in this Society. 3500*l.* were contributed for this purpose from its own funds, which, with 2000*l.* given by the government, had the effect of breaking up a monopoly of the Thames fishermen, and of diminishing the price as well as increasing the quantity of a very agreeable and important article of food.

'ould draw out this Address to an un-e length if we were to follow in detail propriation of various other sums—for vention of machines to spin several s at once (prior to the construction of inning jenny); for dying Turkey-red; king morocco leather; for improving anufacture of crucibles; for weaving nets by machinery, in which is con- the germ of the lace frame; and for acing the culture of the Eastern spices ae West Indian colonies. Enough, st, has been shown to establish the at the Society, in the early period of istence, has wisely and successfully yed the funds entrusted to its distri- .

n this time the Society began to pub- transactions, which now form a series -one volumes. To attempt an abstract even a selection from such a mass of als, would be very ill timed on the t occasion, as it would necessarily o details which would swell this s into a treatise. We may, however, ntly appeal to the many interesting portant inventions described in these s, (models of most of which are at all gratuitously open to the inspection and the public,) and found upon them aims to the continued support of our ymen.

FOREIGN RAILROADS.

(From the *Railway Times.*)

NOVER.—At a meeting held at Minden, 11th of October, directors were chosen intended Rhine and Weser Railway. e 5th of December the directors held first meeting at Elberfield, and are to d, in succession, to various other points line where there are any doubtful ons to settle, in order to consider and them on the spot. They intend to ence the works forthwith, at four diffe- laces—at Minden, the termination of eser; at Dentz, the suburb of Cologne, rmination of the Rhine; at Schwelm, which they are to work towards the ; and at Linderhausen, where a great is to be executed, which renders it ble that, to prevent future delay, the should be begun at once. The main e of the line is, of course, to connect vigation of the Rhine and Weser, but it en remarked that, from the frequent se of the waters of the latter river in ummer season, it will often be found cticable for vessels of a large size to so high as Minden, and it will be necessary to continue the railway on men. Should this be really the case, will be a lamentable waste of capital in this project, as Minden by no means lies in a direct line from Bremen to Cologne. The call, however, which has just been made by the directors of 5 per cent. upon each share, appears to have been met with readiness.

SAXONY.—In the monthly report of the directors of the Leipsic and Dresden Railway, dated November 30th, they congratulate the shareholders on the additional advantages likely to result from the formation of the Magdeburg and Leipsic Railway, which will join on to the former line. The number of workmen employed on the Leipsic and Dresden Railway, in November, was still 5,880; but, in consequence of unfavourable weather, the works had advanced but slowly. At the end of September, eight miles (German) had been levelled; at the end of October, eight miles 4-5ths; and, at the end of November, only 9½.

BAVARIA.—The proposal for a railway from Nuremberg to the northern frontier has been received with unexampled enthusiasm. The subscription was no sooner opened at Nuremberg, that not only all the shares were taken, but applications made to double the amount. It was thought that some of the applicants might be gratified with shares which had been originally reserved for Munich and Bamberg, but the first intelligence received from those cities was that they were all disposed of. It is a still more remarkable fact, that the interest taken in this undertaking is not confined to Bavaria, or even Germany; but that applications for shares, to the amount of one-sixth of the whole capital, were received, in two posts, from Milan.

BELGIUM.—The inconvenience will soon be remedied which has been complained of in the Antwerp and Brussels Railway, that trains were sometimes compelled to wait at Mechlin. Another set of rails is being laid down along the line. This railway appears to be one of the most prosperous in Europe.

GREAT NORTH AMERICAN RAILWAY.

The recent events in Canada, and the message of the President of the United States, render interesting all accounts of the progress of the great railway which the British Government has, for the last three years, been constructing through New Brunswick to the St. Lawrence river at Quebec.

This line of railway was projected, in the first instance, by a writer in the *United Service Journal*, for the month of May, 1832. The purpose for which it is being constructed, is to cut off a navigation of 1200 miles of the bay and river of St. Lawrence from the Atlantic Ocean to the city of Quebec. The line will commence at the harbour of St.

Andrew's, in the bay of Fundy, and pass through the province of Nova Scotia, and by Fredericktown, which is the capital of the colony; the whole length of the line being about 195 miles from St. Andrew's to Quebec. The advantages of this railway to the commerce of Canada must become of the most extraordinary kind; for besides cutting off the distance referred to, of a most circuitous, expensive, and dangerous navigation from the Atlantic to Quebec, it will, at the same time, enable the trade of Canada to remain open during all seasons of the year. At present the St. Lawrence river is blocked up by ice from the latter end of November to the middle of April; and the floating icebergs in the Bay of St. Laurence prevent the approach of shipping in general until the 5th of May. But on the other hand, the harbour of St. Andrew is never closed at any season of the year, and it is a very deep, capacious, and well-sheltered port. At present there is scarcely any proper road through the province of New Brunswick to the St. Lawrence river, or the intensity of the cold of the winter months renders it very difficult to travel by means of horses and waggons; but all the difficulties of keeping up the intercourse will be entirely obviated, when the passage from Quebec to the Atlantic can be made in about twelve hours, and by means of steam locomotive power. The winter will indeed become the principal season for trade and intercourse between Lower Canada and New Brunswick, and the Atlantic Ocean; whereas at the present time, the timber, ashes, wheat, furs, and other exports of the colonies, are obliged to be accumulated in great quantities during the winter months, to the great loss of interest in the capital employed, and to the abolition of all active commercial operations, during full one-half of the year.

Unfortunately, however, the line is through a great extent of the territory which is included in the disputed question of the boundary line. The further progress of the work has recently been stopped at the request of the President of the United States, which the Earl of Gosford has thought it prudent to comply with, in order to prevent the breaking out of an active opposition which has been threatened by the state of Maine. But as the message of the President, which has been lately received in England, contains expressions which must compel an early settlement of the question of the boundary line, it is to be hoped that there will remain no obstacle to the resumption of the works in the spring of the ensuing year.

ROYAL CORNWALL POLYTECHNIC SOCIETY; PREMIUMS FOR 1838.

A Premium of Ten Guineas, by Sir Charles Lemon, Bart., and R. W. Fox, Esq., for the best reports of a series of experiments made with the wedge for blasting rocks, invented by Mr. R. W. Fox, which was described and figured in the third report of the Society.

A Premium of Ten Guineas, by W. T. Pread, Esq., for the best chemical or mechanical plans for ventilating mines, that can be applied to the Cornish mines with advantage.

A Premium of Ten Guineas, by G. C. Fox, Esq., for the best essay on the various diseases incidental to miners, their causes, and the best practical means of remedying them. Any statistical information as to their longevity compared with that of the other population of the county, is deemed highly desirable.

A Premium of Ten Pounds, by John Hearle Tremayne, Esq., for the best available method, or improvement on the plans already suggested, for facilitating the ascent and descent of miners; provided the judges shall consider it to possess sufficient merit to be entitled to the premium.

A Premium of Ten Pounds, by Thomas Teague, Esq., to be added to the Premium offered by J. H. Tremayne, Esq., for the best available method, or improvement on the plans already suggested, for facilitating the ascent and descent of miners.

A Premium of Five Guineas, by John Taylor, Esq., for the most complete and accurate accounts of the quantity of water supplied to the boilers, the number of bushels of coals consumed, and the duty performed by an engine, for a period of not less than six months in the ensuing year.

A Premium of Ten Pounds, by the Rev. Canon Rogers, for the most economical, safe, and efficient plan for lighting mines, consistent with the health of the miner.

A Premium of Three Guineas, by Charles Fox, Esq., for the best model (either original or copy,) not less than eighteen inches in length, of a life-boat, which shall be judged most manageable in a storm. Economy in the construction is a great desideratum.

Three Premiums, by Charles Fox, Esq., the first of Three Guineas, for the best description and drawings of the least inconvenient, and inexpensive, and, at the same time, most efficient means of securing a fortnight's supply of bread and water, within reach of a ship's crew, in the event of their not being able to go below deck, owing to the vessel being water-logged, or to other causes: the number of the crew may be

estimated in the proportion of 15 tons register to each man. The Second Premium of Two Guineas, for the second best; the Third one Guinea, for the third best.

A Premium of Ten Guineas, by J. T. Price, Esq., of Neath Abbey, for the best set of experiments on the heating power of anthracite, and the strength and tenacity of anthracited cast-iron, first and second fusion; as compared with the strength and tenacity of Welch, Scotch, and English cast-iron of parallel qualities, first and second fusion, made with ordinary coal, or coke. To be accompanied by a well attested statement of the proportions of anthracite and common coal, and of the kind of ore and flux used in the manufacture of each.

A Premium of Ten Pounds, by Sir Charles Lemon, Bart., M.P., F.R.S., President of the Statistical Society of London, for the best essay on the Statistics of the County.

A Premium of Ten Pounds, by Capt. Jenkins of Assam, in India, for the best essay on the several descriptions of fishing boats used on the coast of Cornwall, and in the Scilly Islands; with particular advertence to their manageableness and capacity, and their good qualities under oar and sail, their adaptation (particularly as to safety) to their respective fisheries:—containing also a comparison of our fishing boats with those of any other coasts in Great Britain or elsewhere, and suggestions for their improvement. To be accompanied by drawings.

A Premium of Five Pounds, by Capt. Jenkins, of Assam, for the best model and working plan of a fishing boat (or for either) on an improved construction.

A Premium of Five Pounds, by Henry English, Esq., of the Mining Journal and Mining Review, for the best paper containing an account of any methods or plans, practised in other mining districts, advantageously applicable to the Cornish Mines. To be accompanied by the necesssary drawings.

A Premium of Five Guineas, by John Taylor, Esq., to be given in addition to the prize awarded by the Society, for the best Article in the department of Mechanical and Scientific Inventions and Improvements; provided the Judges think it sufficiently deserving.

A Premium of Ten or Five Guineas, according to the merits of the production in the opinion of the Judges, by the Rev. W. J. Coope, for the best Treatise on Beacon Lights, containing details of the most approved plans already in operation, and suggesting any improvements likely to render them more practically efficient. Further particulars respecting this Premium, may be had on application to one of the Secretaries.

Charles Fox, Esq., offers to the Society, as long as he continues a member of it, the sum of *Four Pounds* annually; to be distributed in the respective sums of *Two Pounds*, *One Pound*, *Twelve Shillings*, *and Eight Shillings*, in four several prizes, for the neatest and most correct maps of some one state, province, or European Colony, comprising not less than 144 square miles; or a portion of not less than 100 square degrees of some uncivilized region,

These Prizes to be called the *Lander Prizes*, in commemoration of those enterprizing travellers, Richard and John Lander. The principal rivers, lakes, chains of mountains, line of coast (if any,) and territorial line should be accurately delineated; and the size of the most important cities, or towns, with their latitudes and longitudes, should be correctly marked. The maps should be accompanied by the fullest practical information (with reference to authority,) either respecting the principal river flowing through the country, as to the length of its course; its breadth at different places; its tributary streams, lakes, and canals; its periodical rise, its average fall per mile, and the rapidity of its current; the progressive increase of alluvial deposit in its formation, and the obstructions which may be opposed to its navigation;—or respecting the physical characters of the principal chain of mountains in such country, their general direction, respective heights, geological features, more important passes, limit of perpetual snow, and the elevations at which various trees and plants will flourish on their sides.

LOVEL SQUIRE, THOMAS B. JORDAN, } *Secretaries, Falmouth.*

ANOTHER HYDRAULIC TELEGRAPH.

We have seen a model of a telegraph invented by Mr. Rowley, surgeon, Royal Navy, of Grosvenor-street, Chorlton-on-Medlock, which possesses the merit of novelty, at least, if not of efficiency. It consists of a number of lead pipes, of from a quarter to half an inch bore, each connected at one end with an air receiver, inverted in water like a gasometer, and each having a separate stop-cock; the other end of each pipe being immersed in an eight-ounce white glass bottle, three-fourths full of water. The pressure on the air in the receiver, of course, propels a stream of air along any pipe of which the tap is turned so as to admit air; and the effect of this is an instantaneous bubbling of the air at the extremity of the pipe, as it escapes

through the water in the bottle. The pipes n the model are about ten feet in length; but the inventor has tried an experiment with a length of the same piping, extending (in coil) to the length of four hundred feet; and simply blowing into one end of the pipe, the bubbling in the water was produced at the other almost instantaneously. It is obvious, that, the pipes always containing air, any quantity suddenly forced in at one end must produce a concussion which is transmitted with great velocity through the whole length, and the same quantity of air must be expelled at one end as is thrown in at the other. The details of the adaptation of this principle to telegraphic purposes are perhaps scarcely matured in the consideration of the inventor; but the following will be found to be the principal points. Six pipes so prepared are marked at each end in this way:—

*	A	B	C	D	E
	1	2	3	4	5

The one marked with an asterisk or star, it is proposed to use as the preparatory signal, to call attention at the other terminus, and also as a stop between each word or signal. The permutations and combinations of the five letters alone would form a tolerably copious stock of signals; but these might be extended immensely by a vaiiety of well-known contrivances. With respect to the cost of a telegraph of this kind, it is clear that the pipes would form the most considerable item. Lead piping of sufficient bore could be supplied, we believe, at something more than 20*l.* a ton: and of this piping a ton weight would make a mile in length. In application, for instance, to the Liverpool and Manchester Railway, each pipe would cost about 600*l.* or 3,600*l.* for the six pipes, and the whole cost of such a telegraph for that distance would not be more than 10,000*l.* The inventor has little doubt that a communication could be made to Liverpool, and an answer received in Manchester, in a few minutes, and quite as easily by night as day, if that were necessary. This telegraph would not need to be attended by any scientific person; any one of ordinary intelligence would be capable of managing it, and transmitting any desired communication. At present the model is only constructed to work in one direction; but it is very obvious, that by having double terminations to the pipes, they may be made to
convey intelligence in either directic
must confess we are rather sceptic
the accurate working of a telegrapl
construction between any two distinc
as for instance, between Manche
Liverpool. Perhaps if the pipes w
perfect in their whole length—free
from fissures, but from irregularitie
joints—the impulse given at one e
be communicated with tolerable
and exactness at the other; but we
it would be somewhat difficult to p
miles of pipe that would be free fr
imperfections, and they would, in al
bility, very seriously affect the resu
conceive that along a very good
impulse would proceed in much l
than along a bad one, so that the sig
at the first, might arrive before the sec
the figures 91, for instance, might b
into 19. It is a point, however, o
experiment alone could give a sati
decision.—*Manchester Guardian.*

NOTES AND NOTICES.

Bridge over the Danube at Pesth.—W
by the German papers, that Mr. George R
eminent engineer who had been summoned
in Hungary, to be consulted respecting th
nent bridge it is now intended to establis
Danube in that city, in place of the prese
of boats, left Pesth for England by way
on the 10th of November. He made in a
all the observations necessary to be ma
spot, and is under an engagement to sen
the proposed undertaking to Hungary by
next. We also learn from the Pesth and Bud
that Mr. B. Albano, the engineer, w
George Rennie, on his return from henc
land had left behind, in order to prosecute
the investigations commenced by him relat
building of the bridge, took his departure o
of November for England. He has not o
into consideration again the data which
obtained before, comparing them with th
geometrical surveys that he has taken exp
this purpose, with the most scrupulous acc
he has also carried with him sundry sa
materials in regular shapes, in order to
their eligibility as regards strength and d
by experiments.

Engineers' Dinner to Robert Stephenso
The Engineers who have been connected
Birmingham Railway, gave a dinner to Mr.
son on the 23d ult., and presented him wit
of plate consisting of a silver tureen a
manufactured by Collis of Birmingham,
guineas, and bearing the following inscript
"To Robert Stephenson, Esq., Enginee
of the London and Birmingham Railway,
of respect and esteem from the membe
Engineering department who were employ
him in the execution of that great wo
sented on the eve of their gradual separat
23rd, 1837."

LONDON: Printed and Published for the Proprietor, by William Angus Robertson, at the
Magazine Office, No. 6, Peterborough-court, between 135 and 136, Fleet-street, in the P
Bride, in the City of London.—Saturday, December 30, 1837.

Mechanics' Magazine,

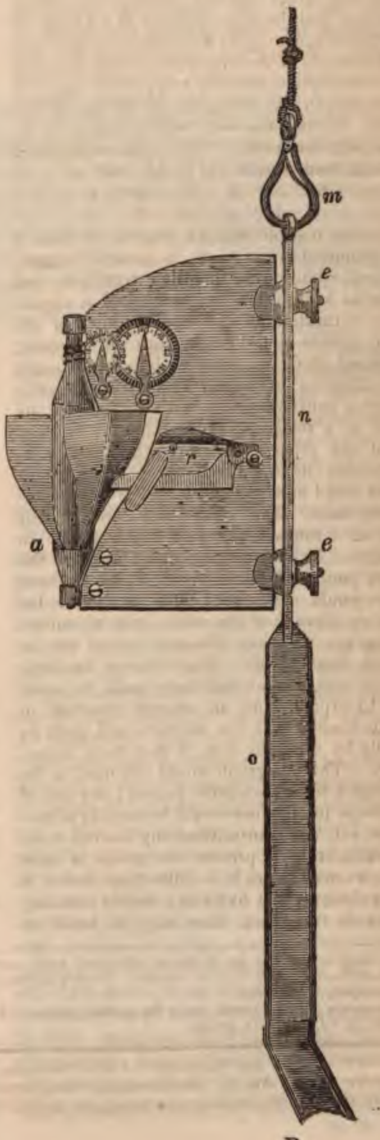
USEUM, REGISTER, JOURNAL, AND GAZETTE

. 753.] SATURDAY, JANUARY 13, 1838. [Price 3*d*.

ASSEY & WINDHAM'S PERPETUAL LOG, AND DEEP SEA LEAD.

Fig. 1

Fig. 2.



MASSEY AND WINDHAM'S PATENT PERPETUAL LOG, AND DEEP SEA LEAD.

Sir,—The accompanying drawings are of two important nautical instruments, fig. 1 (see front page) being a perpetual log (so called from its telling the number of knots or nautical miles the vessel has gone through the water in any given period, and registering up to 100 knots); and fig. 2, an improved sounding machine for ascertaining the depth of water. Before the invention of the log and sounding machine, upon which these are improvements by Messrs. Massey and Windham, the methods for ascertaining these particulars were extremely rude, and could at most only give an approximation to correctness. I will just give your readers, who may not be acquainted with the original methods, a description of them, in as brief a manner as possible, so that they may be the better enabled to judge of the merits of the improvements I am about to describe. This description to correspondents such as Nautilus, I am aware will be unnecessary; but as many of your readers are not conversant with nautical subjects, I hope they will not be found useless nor uninteresting. First, the log: the old method was for the seaman to throw overboard at the bow of the vessel, a chip, or any floating object, and keeping up with it, as it drifted aft, judged by the speed of his walking or running, the rate at which the vessel was sailing. An improvement upon this was the log-board; a quadrant shaped piece of wood, loaded on its circular part with lead. At two of its corners, pieces of line are fastened, which are affixed to the log-line, on which is fastened another piece of line, the same length as the foregoing pieces, furnished with a peg, by the insertion of which, in the hole at the third corner of the log board, it is made to hang perpendicular with the log-line. The peg with the third line being fixed in its place, the log-board is thrown overboard, and the resistance of the water against the flat surface of the board has the effect of keeping it nearly stationary in the water in the situation in which it was first thrown. A sufficient quantity of line being allowed to run off the log-reel, which turns freely on a pivot, and which line is called "stray line," and is for the purpose of letting the log-board get well out from the stern, the end of which stray-line is shown by a piece of red cloth being attached) the officer who has the "heaving of the log" calls to a seamen, who holds in his hand the log sand glass to "turn"; the line is then suffered to run astern until all the sand is passed into the bottom division of the log-glass, and is then stopped, and the number of knots, in length of the line, which has been unreeled, counted. The log-line by being stopped, draws the peg out of the log-board, and it is then hauled inboard. The knots measured on the log line are fractions of a nautical mile, made to correspond with a half-minute glass. In rough weather another glass is used. It will be perceived, that this method, though much superior to its predecessor, can only give an approximation to correctness; and that for only half a minute. The vessel may sail a knot more the first hour of the watch than in the last, and thus errors in the log must invariably creep in, which have to be allowed for by the experience of the seaman.

The improved perpetual log registers inboard, and having the rotator *a* constantly in the water, and in action, it must give correct results. The advantage gained by registering inboard, is to the log, what the going fusee is to the watch; the motion of the rotator continuing uninterruptedly throughout the voyage. When it is considered, that by the old method, if only one minute of time is occupied in hauling in, reading off the distance, placing the hands, and veering astern again, in every two, or at farthest four, hours, the amount of error, in which a vessel will outrun her log during a voyage to America or the West Indies, must be very considerable.

Description of the Improved Perpetual Log.—Fig. 1, *a a*, the rotator; which revolves once in a given space; V V V, the vanes which cause the rotator to revolve when drawn after the vessel in an horizontal position, and which communicates inboard by the cord *c*. Each division of the first circle (as a half-minute is of an hour) is the 120th part of a mile; *i. e.*, 51 feet or half-minute knots. This circle is divided into twelve parts. The number of these divisions the index passes in a half-minute, is the vessel's present speed in miles per hour. The

Fig. 3

second hand revolves once in one nautical mile, the third in ten miles, and the fourth in a hundred miles.

Fig. 3 shows the method in which the log is drawn after the vessel. A is a lead drawn as shown with a triangular bar C, which contains the rotator D; B is the line to which the lead is fastened; E, a small line leading inboard from the rotator, and which gives motion to the train of wheels in the register.

The sounding machine is calculated to give correct perpendicular soundings, without "heaving to" or stopping the ship's motion through the water,—no easy task, when blowing fresh off the chops of the channel. The old method of obtaining sounding, was as follows:—The ship was hove to, by backing the sails on one mast, so as to counteract as nearly as possible the action of the wind on the sails. The lead was then passed outside clear of every thing to the bowsprit, a number of men being placed along the gangway with coils of the line ready to heave overboard at a moment's notice; the lead was then thrown, and as it passed each man he called out "watch!" to prepare the next man to throw his portion of the line overboard. The officer held the last portion of the line, and could easily feel when the lead struck the ground, and he then counted the number of fathoms that was off the reel down to the water's edge, allowing so many according to his judgment, for the angle which the line made from the perpendicular. Now this method would give correct results in sixty fathoms, within perhaps ten fathoms or a little more for the amount of error, depending on the expertness of the operation. By the improved sounding machine, the necessity of "heaving to" is obviated, and a great saving of time, labour, and risk in bad weather, effected. In fig. 2, *o* is the lead, to the bar of which is affixed by two screws *e*, *e*, a plate containing the rotator *a*, which has its vanes placed at an angle which causes it to make a revolution in a given number of feet, which are reduced to fathoms. At the upper end of the rotator is placed an endless screw, giving motion to two wheels which register the number of fathoms through which the lead has passed in its perpendicular descent. *p* is a piece of brass which locks the rotator, and prevents its revolving while hauling the sounding machine inboard. During its descent the action of the water keeps this piece (which is shaded dark in the engraving in an upright position), but immediately on the lead striking the ground it falls into the position shown in the engraving, and prevents the motion of the rotator either way.

A hollow space is formed in the bot-

tom of the lead, which is filled with tallow to bring up a portion of the bottom of the sea, by observing which, and the depth of water, the navigator may be pretty certain of his situation. In obtaining soundings, in depths greater than from 100 to 120 fathoms, the rotator is apt to burst from the pressure of the water; but as for general purposes, soundings are seldom taken in more than 80 or 90 fathoms, this is but of minor importance. I have only to add, that I have tried both the improved log and lead, and am perfectly satisfied, that they are competent to perform all that was ever intended by their inventors.

Trusting I have not infringed too much on your valuable space,

I remain, Sir, your obedient servant,

E. Whitley Baker.

Old Broad Street, Jan. 1, 1838.

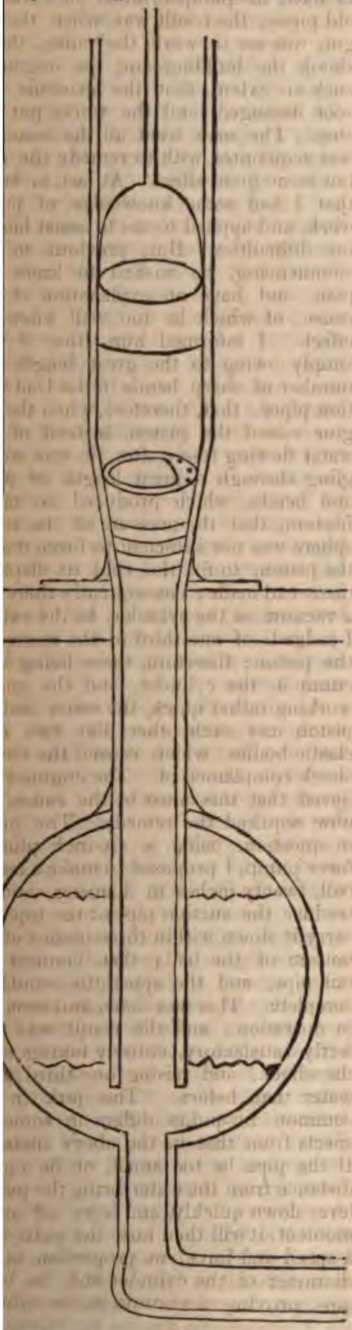
HANSON'S IMPROVED PUMP,—WILLIAMS'S TREFFOS PUMP.

Sir,—Allow me, through the medium of your valuable Magazine, to transmit some information to Mr. Richard Evans, respecting Mr. Williams's treffos pump, and also upon one on the same principle invented by myself.

About ten years ago, I fixed a pump with a long train of suction pipe, lying on an inclined plane. When complete it worked very unpleasantly, so much so, that I was likely to have my pump returned on my hands. It is a common saying, that "necessity is the mother of invention"—in this instance it was verified. I set my wits to work, to save my pump, and a "treffos" (so called) was the result of my cogitations; of which invention I have made extensive use ever since, and a very valuable auxiliary it is found to be, to the most of pumps. The form of my treffos, however, somewhat differs from that of Mr. Williams's; but the thing is the same in principle, as will be seen by the drawing annexed. I see no need for the screw cap; I have found no occasion for it; and if the cap be done away with, the valve may also follow, as it only holds the water in the pipes from falling, in case the cap-joint, or some imperfection in the work, should draw air.

About two years ago, an engineer erected a steam-engine and pump, to lift the sulphureous waters for our public baths; he fixed his pump-cylinder to a train of old pipes; the result was, when the engine was set to work the pump, that it shook the building and the engine to such an extent, that the machine was soon deranged, and the works put to a stop. The man tried all the means he was acquainted with to remedy the evil, but to no good effect. At last, he heard that I had some knowledge of pump work, and applied to me to assist him in his difficulties. But, previous to my commencing, he wished to know my plan, and have an explanation of the cause, of which he too well knew the effect. I informed him, that it was simply owing to the great length and number of sharp bends in the lead suction pipes; that, therefore, when the engine raised the piston, instead of the water flowing freely after, it was struggling through a great length of pipes and bends, which produced so much friction, that the pressure of the atmosphere was not sufficient to force it after the piston, to fill the void its displacement had made; consequently there was a vacuum in the cylinder, to the extent, I judged, of one-third of the motion of the piston; therefore, there being a vacuum in the cylinder, and the engine working rather quick, the water and the piston met each other, like two non-elastic bodies, which caused the violent shock complained of. The engineer believed that this must be the cause, and now required the remedy. The pump in question, being a six-inch plunger force pump, I proposed to make a leaden ball, twenty inches in diameter, and introduce the suction pipe at the top, and carry it down within three inches of the bottom of the ball; then connect the tail pipe, and the apparatus would be complete. This was done, and soon put in operation; and the result was perfectly satisfactory, entirely taking away the shock, and raising one-third more water than before. The jerk in the common lift-pump differs in some respects from that in the above instance. If the pipe be too small, or be a great distance from the water, bring the pump-lever down quickly, and leave off at the moment; it will then raise the water with a speed and force, in proportion to the diameter of the cylinder and the leverage, proving a vacuum in the cylinder;

if you bring it down again, and hold



instant, you will feel the water strike the bucket bottom, and recoil on the valve with violence, which produces the shock or jerk. I have lately fixed an air vessel to a pump, that was in this predicament, belonging to a large brewery; the suction pipes were nearly one hundred yards long: it has given great satisfaction.

The drawing being so simple, it needs but little explanation. When the pump is set to work, it exhausts the air vessel, and the pipes also; and when pumping, the water will lute the pipe end in the vessel, (as may be seen by the water line in the drawing); but at the moment of cessation the water will flow into the vessel to a height in proportion to the state of exhaustion by the bucket or piston; at the next stroke the pump will drink out of the air vessel, which will be nearly full of water, while a continuous stream will flow through the suction pipe, so long as the piston is kept in motion, whether it go up or down. I have put down an eight-yard pump, with $3\frac{1}{2}$-inch cylinder, 12-inch ball, and $1\frac{1}{4}$-inch suction pipe, which works as well as a 2-inch pipe would. But Mr. Williams's $\frac{3}{4}$-pipe would appear quite disproportioned for a $3\frac{1}{2}$ inch cylinder, unless he has a very large air vessel. In that case he might pump a pail full or two out, and allow the pump to rest a short time till the void were filled up by the suction pipes; and the time it would occupy in filling would depend upon the circumstance of the pipe being a long or short length: indeed, under the most favourable view of the $\frac{3}{4}$ in. pipe, he could only have a stream of water equal to 32 feet of altitude, (observe the loss of power in this case); but if the well were 16 feet deep, he would have a stream equal to only half of that height, and so on in proportion, until the suction came to the extremity. Care should always be taken, to make the pipe that drinks out of the air vessel, the regular working size: choose what proportion the suction pipe is to be, and in all cases of long trains, if you wish the pump to work well, make the pipes of the usual proportions, with the addition of the air vessel. The air vessel above the pump valve I call a condensed air vessel, but the vessel below the valve I call the exhausted air vessel.

I am, Sir, your's respectfully,

GEORGE HANSON, Plumber.

Market Street, Huddersfield, Yorkshire.

ABSTRACTS OF THE PHILOSOPHICAL TRANSACTIONS.

In the "good old times" the labours of the Royal Society were made publicly known (so to speak) by the appearance, at slow and solemn intervals, of the ponderous quartos denominated "Philosophical Transactions." A year or two back, however, the exclusive importance of this series was broken in upon by the resolution of the council to send forth, in the compass of two moderate octavo volumes, an "Abstract" of the papers read before the Society during the first thirty years of the present century; and this step was followed up by another—still more in countenance with the moving spirit of the time,—to which we are already indebted for the appearance of a third volume of the "Abstracts." It was determined, that in future, the contents of the journal-books, recording in an abridged form the proceedings of the meetings as they occurred, should, instead of reposing undisturbed, in their manuscript state, on the shelves of the library, be printed at short intervals, somewhat in the form of a periodical, circulated among the members, and, when of sufficient bulk, collected into volumes, as a companion to, perhaps in some sort a substitute for, the less accessible "Transactions" at full length. The present volume is the first which has come to maturity under this arrangement; an arrangement which could hardly have proved detrimental to the Society, even had it not been absolutely called for by the voice of a scientific public, *rather* more extensive in its numbers, and more impatient in its demands, than the public of the unlocomotive age in which the Society began to flourish,—not quite two centuries ago!

The book reflects accurately enough the researches in which our leading men of science have been engaged during the period to which its contents refer. Electricity, especially in its connexion with magnetism, is the subject which takes the foremost place, as might be expected, when the rapid strides recently made in what may be termed the "new science" of electro-magnetism are considered. *Dr. Faraday*, especially, contributes a *whole series* of "Experimental Researches in Electricity," which, of themselves, are sufficient to constitute a new era in the science; and the late Professor Ritchie follows in his wake with a similar, but less important and extensive collection of "Researches in Voltaic Electricity;" while numerous other papers on the same subject are scattered throughout the volume, not the least interesting, being a paper on the true position of the magnetic pole, by Commander Ross, the nephew of Sir John. Next in number and importance are the Essays on "the Tides," the fruits of the elaborate researches instituted by Mr. Lubbock and Professor Whewell, who vie with each other in elucidating the intricacies of that puzzling and, till lately, too-much-neglected subject. The body of information brought before the public by their exertions, cannot fail to produce beneficial results, even if the theoretical parts of their disquisitions should be held to bear too great a proportion to the remainder. Had we room, we should be inclined, at any rate, to extract the descriptions of some of the numerous ingenious contrivances for ascertaining and registering the height of the tides, force and direction of the winds, &c., invented and applied by Mr. Lubbock, in his laborious search for those best supporters of true theory—solid and substantial facts.

As usual, the application of Science to the Arts does not meet with much attention in the pages of these "Abstracts;" nor is this, perhaps, to be greatly regretted, when it is considered, that the hiatus thus caused, will most probably be filled up by some one or other of the numerous associations devoted to the particular branches of science or its application, which are springing up almost daily around us, and threaten in some degree to *swarm* the older and more general societies. Papers which, under the old state of things, must have seen the light in the Philosophical Transactions, or not at all, may now fairly be expected to appear in the more appropriate pages of the Transactions of the Institution of Civil Engineers, or of British Architects, and others whose investigations are confined within a narrower sphere than the whole "circle of the sciences." What is to become of the Royal Society, when each and every branch shall have its separate association, it is difficult to say;—suffice it, that at present, in spite of these competitors, its Transactions display no falling-off i

ity or quality. The mass of infor-
n afforded by the new-comers is
ar gain.

ong the few papers of a practical
ption, we have one on "New Facts
the production of Steam," by Mr.
Perkins, and another on the same
t by Dr. Lardner, the main points
ch have already appeared before
blic in other ways, as is the case,
, with the majority of the papers
g to matters of general interest.
ssay on the Warming and Ventila-
Apartments, by Dr. Ure, for in-
, has appeared at full length in the
nics' *Magazine*; and many of the
ed facts adduced in isolated papers
ave already become "matters of
r" in the Reports on the Recent
ss of the Sciences, contained in the
ctions of the British Association.
night the "Council" be led to
t that the day of the humdrum
mbering quarto was gone by!

specimen of the manner in which
pers are compressed, we give the
t of one by Professor Barlow, who,
ieve, with the single exception of
rdner, is the only theoretical phi-
er who has devoted any attention
deeply-interesting point of prac-
ience to which it relates:—

paper was read, entitled, 'On the
on of the Mechanical effect of Gra-
on a Line of Railroad.' By Peter
, Esq., F.R.S.

e exact amount of the influence of
and descents occurring in the line
ay on the motion of a load drawn by
otive engine, having been differently
ed by different persons, the author
uced to investigate the subject. A
ervations are premised on the erro-
ssumptions which, he conceives, have
ral vitiated the results hitherto de-
The first of these is, that the ex-
re of power requisite for motion is
o the resistance to inaction; whereas,
t always greatly exceed it. No ac-
he remarks, has been taken of the
e of the atmosphere on the piston,
the force of the steam has to over-
efore it can be available as a moving
Another source of error has been,
e statical and dynamical effects of
have been confounded together;
s, they are the *same in amount*, only
e *body is put in motion by gravity*;
*when it is urged down an inclined
an extraneous force*. In the latter
e *effects are no longer comparable*; friction being a force which, in an infinitely small time, is proportional to the velocity, while that of gravity is constant at all velocities; or, in other words, the retardation from friction is proportional to the space described, while that from gravity has reference only to the time of acting, whatever space the body may pass over in that time. It is an error to assume that the mechanical power of the plane is equivalent to a reduction of so much friction; for the friction down the inclined plane is the same as on a horizontal plane of the same length, rejecting the trifling difference of pressure; and the whole retardation in passing over the plane, or the whole force required to overcome it, is the same at all velocities, and by whatever force the motion is produced; but the assisting force from gravity is quite independent of the space or of the velocity.

"In the investigations which the author has presented in this paper, he assumes that equal quantities of steam are produced in the same time at all velocities; and he adopts for his other data, those given by Mr. Pambour in his Treatise of Locomotive Engines; he deduces a formula from which, the speed on a level being given, we may compute the relative and absolute times of a train ascending a plane; and consequently, also the ratio of the forces expended in the two cases; or the length of an equivalent horizontal plane; that is, of one which will require the same time and power to be passed over by the locomotive engine as the ascending plane.

"The next objects of enquiry relate to the descent of trains on an inclined plane, and comprise two cases; the first, that when the power of the engine is continued without abatement; and the second, that when the steam is wholly excluded, and the train is urged in its descent by gravity alone. The author arrives at the conclusion, that in the first of these cases, when the declivity is one in 139, the velocity, on becoming uniform, will be double that in a horizontal plane; and that for a declivity of one in 695, the uniform velocity of descent will be one-fifth greater than on the horizontal plane; and this he observes, is perhaps the greatest additional velocity which it would be prudent to admit. A plane of one in 695 is therefore the steepest declivity that ought to be descended with the steam-valve fully open; all planes with a declivity between this and that of one in 139, require to have the admission of steam regulated so as to modify the speed, and adjust it to considerations of safety; and lastly, all planes of a greater slope than this last require, in descending them, the application of the brake."—p. 390.

The abstracts of papers read, although the staple of the volume, do not occupy it exclusively. It contains, at full length, in addition, the annual orations of the President on St. Andrew's Day, with his sketches of the lives and characters of the Fellows of the Society deceased during the year. His Royal Highness the Duke of Sussex has been President during almost the whole of the period embraced by the present volumes; and it must in fairness be allowed, that his addresses to the assembled Fellows, form by no means the least excellent or interesting portion of the work. Unfortunately, his Royal Highness was too often prevented by a painful calamity,—the temporary loss of sight,—from attending to the duties of the chair so regularly as might have been wished, or as he was evidently anxious to do. When he *was* able to attend,—and there has now happily been no interruption for a considerable time,—the manner in which the duties falling to his share have been discharged, has been such as to leave no room for regret, that a member of the Royal Family should have been chosen for the distinguished station, in preference to some philosopher lower in the scale of birth and influence, although of higher pretensions to scientific eminence. On first assuming the chair, the Duke entered at some length into this very question, and fully justified the choice of the Society, by showing (with great modesty, but equal truth) in how many points of view a person in his own situation might be considered a preferable President to a less-exalted member of the Society. He then gracefully went on to remove any possible feeling of asperity, by paying a well-merited and well-timed compliment to his fellow candidate for the honour:—

"Having ventured to say thus much upon a subject of some delicacy, though in no respect painful to myself, I trust that I may be permitted to add a few words more upon another topic which is nearly connected with it, and which is to express my respect for the accomplished philosopher to whom I had the honour, I will not say misfortune, to find myself opposed last year. His name has been familiar to me from my earliest years, for it is that of one whom my Royal *Father delighted to* patronize, and which is *inscribed in unperishable* characters upon *the great monuments* of the universe, the *knowledge of* which he contributed so greatly to extend. I knew that venerable man when full of years and of honour, and I can well perceive the feelings of placid triumph and pride with which he must have contemplated the rising promise of his son. What the maturer fruits of that early promise have been, it is not necessary for me to state when addressing the members of this Society: it is sufficient to say, that there is no one among the most illustrious men of England whom the concurrent voice of his countrymen would have pointed out as more worthy of the distinguished and peculiar mark of royal favour and approbation which he has so recently received, than Sir John Herschel. Towards such a man I can entertain no feelings but those of admiration, respect, and good-will, and which, I trust, if fed by a more intimate acquaintance, will ultimately lead to those of sincere friendship."—p. 80.

This language is honourable to both parties,—to "him that takes, and him that gives." The whole conduct of the Duke, in his connexion with the Society, has indeed been such, that we believe the most strenuous of his original opponents would hardly be now inclined to dispute his qualifications for the office he so worthily holds. His rival is one whom it specially delighteth him to honour. It fell to his Royal Highness's lot to present that distinguished philosopher (in those days of scientific *decline!*) with one of the Society's medals, which had been awarded to him for his brilliant astronomical discoveries. Sir John Herschel having already sailed for the Cape, of course was unable to attend in person; and observe how admirably the truly *noble* President takes advantage of this circumstance to "heap honours" on the head of his once competitor:—

"The mention of the name of the second of those distinguished philosophers to whom the royal medals for the present year have been adjudged, recalls my attention to the circumstances under which he has recently quitted his home and his country to pursue his labours in another hemisphere. He has devoted himself, as you well know, for many years at least, as much from filial piety as from inclination, to the examination of those remote regions of the universe into which his illustrious father first penetrated, and which he has transmitted to his son as an hereditary possession, with which the name of Herschel must be associated for all ages. He has subjected the whole sphere of the heavens within his observation to a severe and systematic scrutiny. He ha

nined the position, and described the cter, of the most remarkable of the e. He has observed and registered thousand distances and angles of po- of double stars; and has shown, from omparison of his own with other ob- ions, that many of them form systems variations of position are subject to able laws. He has succeeded, by a combination of graphical construc- vith numerical calculations, in deter- g the relative elements of the orbits, some of them describe round each other, n forming tables of their motions; and s thus demonstrated that the laws of ation, which are exhibited, as it were, niature in our own planetary system, il also in the most distant regions of : a memorable conclusion, justly en- , by the generality of its character, to nsidered as forming an epoch in the ry of astronomy, and presenting one e most magnificent examples of the licity and universality of those funda- al laws of nature, by which their t Author has shown that He is the same y, and for ever, here and every where.

A discovery like this, which we are this alled upon to commemorate, forms a , but I trust only temporary, termina- to Sir John Herschel's European la- . He has long contemplated a voyage e Cape of Good Hope, as a favourable n for observing the constellations of outhern hemisphere, and the magnifi- nebulæ which it contains; and when onsider the space-penetrating power of struments, such as has never yet been ght to bear upon them; his skill and experience, and systematic diligence observer; his perfect familiarity with lass of phenomena which are to be ob- d; his sagacity in interpreting and dis- gling the most complicated appear- s; and his profound knowledge of phy- as well as practical astronomy, we may forward to a harvest of discoveries, as will not only extend the existing daries of science, but add to the lus- f a name which is known and reverenced ery region to which European civiliza- has reached.

It has been said that distance of space ers the same privileges as distance of , and I should gladly avail myself of privilege which is thus afforded me by John Herschel's separation from his try and friends, to express my admira- of his character, in stronger terms than ould otherwise venture to use; for the age of panegyric, however sincerely it flow from the heart, might be mistaken at of flattery, if it could not thus claim hat of an historical character: but his great attainments in almost every department of human knowledge, his fine powers as a philosophical writer, his great services and his distinguished devotion to science, the high principles which have regulated his conduct in every relation of life, and, above all, his engaging modesty, which is the crown of all his other virtues, presenting such a model of an accomplished philosopher, as can rarely be found beyond the regions of fiction, demand abler pens than mine to describe them in adequate terms, however much inclined I might feel to undertake the task. That he may live to accomplish all the objects which have induced him to transport himself to another continent, and that he may long survive his return, to witness the respect, reverence, and gratitude of his countrymen, is my earnest prayer, in which I am quite sure, that you, gentlemen, will cordially join."— p. 223.

To this prayer we are sure there will be no dissentient voice;—and another might have been added, had any other party been the speaker, with the same chance of an universal good reception.— "May the Royal Society long enjoy the presidency of a scion of royalty whose love for science reflects lustre on his rank, while his rank heightens the brilliancy of his attainments;—the Duke of Sussex."

AVERY'S STEAM ENGINE.

Sir,—There is, I perceive, in your last Number a communication from a correspondent at Edinburgh, which furnishes us with *some data* in respect to the *steam power expended* and the *mechanical effect* produced by the expenditure of that power in Avery's rotary engine; but even these data are as yet imperfect, inasmuch, as we are not told of the pressure in the boiler, nor weight upon the safety valve. If Mr. Ruthven, or any other party will furnish us with the following particulars we shall have little difficulty in comparing the value of Avery's engine with that of the common cylinder and piston, or expansive engine:—

1st. The pressure of steam in the boiler, in lbs. per square inch upon the safety-valve.

2d. The *area* of the aperture in each arm, through which the steam issues.

3d. The radius of the arms of the steam wheel taken from the centre of the shaft to the centre of the steam apertures.

4th. The *diameter* of the pulley upon the steam wheel shaft, from which the power is transmitted (whether by a strap or otherwise) to the machinery.

5th. The number of revolutions per minute of the steam wheel.

6th. The resistance overcome, expressed either in lbs. or in horse power.

If Mr. Ruthven, or Mr. Avery would favour us with satisfactory particulars upon these six points, all doubt and mystification would be at once removed, and we should be enabled to form a judgment concerning the value of this rotary engine, according to the established rules by which steam power is measured. But so long as these particulars are kept back, or imperfectly given, so long must the patentees expect that the public confidence will be witheld. Your Edinburgh correspondent says, the apertures have an area of $\frac{1}{20}$th of an inch, that is, I presume, *both* apertures have an area of $\frac{1}{10}$th; therefore, the steam issuing from the wheel is equal to that which would pass through a steam pipe having an area of $\frac{1}{10}$th of an inch. He further says, that the steam wheel, "may be about the diameter of a large coach wheel;" this is rather vague, but we may suppose the diameter to be about 4 feet; therefore as the arms revolve, the *apertures* describe a circle of about 12 feet, and as this circle is described according to Mr. Ruthven, 3,000 times per minute, the *apertures* pass through a distance of about 36000 feet per minute, *discharging steam through that distance;* and from hence is discovered the power of the wheel. If the speed be increased, the apertures travel through a greater space, more steam is discharged, and more power is obtained. If the apertures be increased, more steam is discharged in travelling through the same space, and more power is obtained. In either case, the amount of power bears a certain ratio to the quantity of steam expended. Taking the data of your Edinburgh correspondent, or rather of Mr. Ruthven, as correct, we arrive at the following:—two apertures having together an area equal to $\frac{1}{10}$ of an inch, discharging steam through a space of 36000 feet, produce a mechanical effect equal to *3 horse power*. We have here then a *column of steam*, the base of which is $\frac{1}{10}$ *of an inch*, and the height or length *of which is 36000 feet*—that is the quan- of steam power expended, and the question resolves itself into this—would that quantity of steam work a 3 horse high pressure engine for one minute? But before the question can be answered, we must know the pressure of steam in the boiler. Every thing depends upon that, and any conclusion to which we might arrive, without taking this into account, must of necessity be erroneous; for increasing the pressure is equivalent to lengthening the column, so that by doubling the pressure, the column of 36000 feet, becomes in fact a column of 72000. It would not be, I apprehend, very difficult to show that the whole is a specious fallacy; but as I have no desire to throw obstacles in the way of well designed efforts, I prefer to wait until we can obtain more correct data.

I remain, Sir, Your's,

HERO THE YOUNGER.

Jan. 9, 1838.

JOYCE'S NEW STOVE AND FUEL.

Sir,—Considerable interest has lately been excited amongst the citizens of London, by the exhibition, at the Jerusalem Coffee House, of an apparently mysterious apparatus for warming apartments. It is in the form of a tall urn, having a pipe running entirely through the centre, with a cap or valve at the top, to regulate the draft. The urn is of thin bronze, about two feet high, and eight inches in diameter. By the combustion of the fuel inside, the metal continues at a dull red heat, and so gives off the caloric to the surrounding air. The fuel is stated to be a vegetable substance, and one charge in a stove of the above described dimensions will burn for thirty hours, and will cost sixpence. No smoke or effluvia is produced.

On referring to your last month's list of new patents, I observe, that the inventor is a Mr. Thomas Joyce, a gardener, of Camberwell; and the title is, "an improved apparatus for heating churches, warehouses, shops, factories, hothouses, carriages, and other places requiring artificial heal; and improved fuel to be used therewith." I presume we must wait until the six months for the specifying, expires, before we shall ascertain what the invention is.

I am, &c.

W. P. BEATH.

Camberwell, Jan. 10, 1837.

ON SPHERICAL, SPIRAL, AND CYLINDRICAL PERCUSSION SHELLS, FOR VERTICAL AND HORIZONTAL FIRE.

(Being Nos. 2 and 3 of Col. Maceroni's papers on Projectiles, &c., submitted to the Ordnance in 1826-7.)

Fig. 1 Fig. 2 Fig. 3

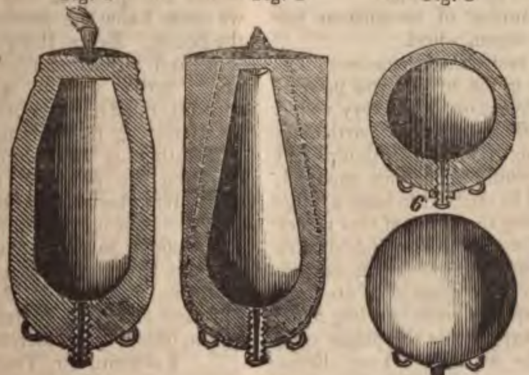
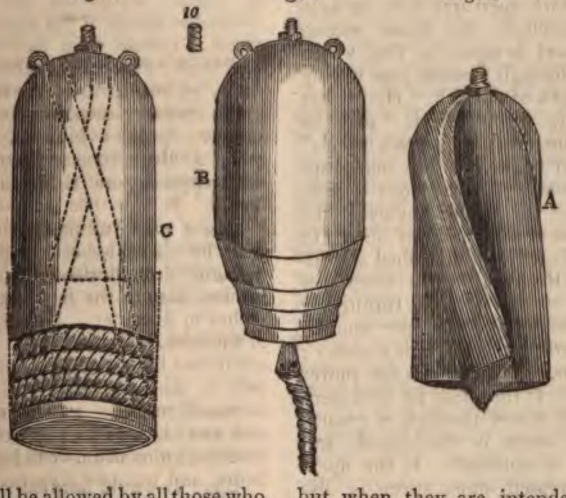


Fig. 6 Fig. 5 Fig. 4



Sir,—It will be allowed by all those who have had opportunities for observation, that in vertical firing, fuse shells are liable to burst either too soon or too late. This of course does not apply to the almost horizontal ricochet firing of howitzer or shrapnell shells, which, in the first instance, have to produce the effect of shot. But in many cases the effect of shells would be much increased, were they, instead of burying themselves in the ground, to explode on the instant *of touching its surface. In the* vertical *firing of shells for the* destruction of *buildings, casements,* batteries, ships in *port, &c., it is well that* they should *burst some moments after* their fall; but when they are intended to annoy troops on the surface of batteries, &c., the shell will produce most effect if it burst either a few yards before reaching the ground, when upon the ground, or when sunk only one or two feet into it. If it be a defect in a shell to explode a second too late, so as not to produce its maximum of effect, it is obviously *far worse* for it to explode *too soon,* so as to produce no *effect at all.* I have observed more than twenty shells in succession, thrown from an English mortar-boat at a long range, to burst at more than five hundred yards in the air, consequently without effect; and I have been informed by a French officer

of rank who was present, that the like occurred with every shell thrown by the English, against certain *distant* French positions at Busaco. Now, at a *short* range, the same fuses would have allowed these shells to bury themselves ten or twelve feet deep in the earth.

I have seen many shells thrown under various circumstances, by English, French, and Italian officers, and I am fully convinced, that notwithstanding every precaution, the above-mentioned imperfection is, *in vertical firing*, inseparable from the use of fuses. This defect, if it be accounted one, I have entirely overcome by a simple, safe, and infallible application of the percussion principle, which I can, at an insignificant expense adapt to common shells, as well as to new ones cast for the purpose. My shell, when thrown at 45 degrees, will either explode on the instant of striking the ground, or it can be made to hang fire from one or two seconds, to any fraction of a second, as it may be deemed expedient, in certain cases, above glanced at.

There have been several plans proposed for the construction of percussion shells, but all such as I have heard of present objections, which render them worse than useless. One striking feature in them is, that they are to be exploded by the means either of certain steels and flints, or by pistons acting in various ways, either in percussion powder, or producing fire by the compression of air; contrivances which, besides their complexity and uncertainty, are of some weight; and, therefore, susceptible of so much reaction upon the shell being projected, as to make it liable to explode in the faces of those who fire the mortar! There is no such danger, or any other, attending *my* application to shells of the percussion principle, which is simple, safe, and infallible.

The nipple *g*, (fig. 1) screws into the shell on the thick side, which will be sure to fall foremost. Its inferior opening is closed by a bit of paper pasted over it, so as to confine the charge of fine powder. If it were not so confined, it would be liable to fall into the shell, if the latter were not quite full, but only half filled; the nipple charge shoots into the powder *like a little pistol*,. If it be desired to *delay the explosion* of the shell for a *second or more*, or any fraction of one, *this delay* may be obtained *ad libitum*, by more or less compressing the powder in the nipple, from the lower opening, by a few blows on a little copper rod.

The copper caps screw into the nipple, like the top of a scent bottle, and is only applied to the shell upon its being placed in the morter or cannon; previously to which, the nipple is covered with a bit of woollen stuff or a tin cap.

The percussion caps for shells should be *at least* half an inch diameter at the crown; and for large shells, one inch.

In some respects, fuse shells are to be preferred, because the *appearance* of the burning fuse causes some degree of alarm and agitation in those on whom it is seen to be falling. The percussion powder for the caps of shells may be made to explode with a slighter blow than that used for small arms; because the cap being screwed into the nipple, without being in contact with its top, no reaction or recoil can cause it to come in contact before the fall of the shell. I line the inside of the caps with a bit of woollen soaked in a mixture of tallow and rosin, which hermetically closes the vent, by two turns of the screw cap.

To convert common fuse shells into copper cap ones, it is only necessary to plug up the vents, and tap another on the opposite, or thick side, called *le culot*.

These *spherical* percussion shells can only be depended on for parabolic projection: fired horizontally, there will be no *certainty* of the cap being foremost.

F. MACERONI.

September, 1827.

CYLINDRICAL ECT., PERCUSSION SHELLS, FOR HORIZONTAL PROJECTION IN NAVAL WARFARE.

Sir,—It would here be out of place for me to enter into any detail upon the subject of the horizontal firing of shells in naval warfare, from coast batteries, and in the *defence* of a fortress. I have composed separate papers on these subjects, and moreover, a work has since been published thereon by Colonel Paixham, which leaves nothing to be desired, either for detail, illustration, argument, or official *proofs* of the tremendous and decisive effects of this application. I must, however, observe that it is very difficult to understand how it has happened and still happens, that all the navies persist in employing, when combatting submergeable and combustil

f wood, the same solid inert balls which they use to batter walls of rdest stone!*—why they persist ing, with their solid shot, such a clatter for a whole day together, r less effect, than they know, *or o know*, they could produce *in five* by the use of hollow projectiles, have been known and applied to purposes for these two hundred

In the British navy, for instance, ual charge for a 24-pound gun is f powder, which communicates to l so great a velocity that at medium es sends it clear through the sides hip; making few splinters, and only a neat round hole, scarcely nough for the introduction of a stick! Now, with only these f powder expended in projecting a nd shot, of about 5½ inches only neter, hundreds of which have been fired into the *hull* of a ithout even putting her *hors de*, much less destroying it, a thirteen ell weighing 200lbs. is projected *itally and even more truly than the id shot* above 1500 yards at the first and then ricoches upon the water 800 yards more! How is it e not to reflect that *one* such shell do more damage, merely by its and comparative small velocity, 24-pound shot; that *moreover* it is 17lbs. of powder and *roche à feu* lode and conflagrate, either em- l in the sides of the ship, or be- decks: in the one case opening an ous irreparable breach, in the destroying forty or fifty men, rning as many more—filling the with an insufferable suffocating, and scattering unextinguishable e in every direction! If, then, breaching effects of projectiles of ten, or twelve inches diameter, be their tremendous, explosive, con- ing and suffocating powers, we e all assured that their use will iately occasion an entire change present system of naval warfare. dred gun ship of the present con- on must be speedily destroyed by ssel or battery that can throw a dozen, or even fewer shells into her sides! Not 13-inch shells only—but even 5, 6, 7, or 8 inch ones, which may be projected from the guns and carronades at present in use!

In allusion to the comprehensive and decisive experiments which have been made in France on the *horizontal* projection of shells and hollow shot into the sides of the largest ships, General d'Aboville, Inspector-General of Artillery, observes, in a memoir dated 1st April, 1800.

"Si l'on considère l'effet prodigeux d'un boulet creux qui éclate dans la numbrure d'un vaipeaux, on ne peut que s'étonner que la marine n'en ait pas saisi l'usage avec empressement. Quel a peu être le motif de l'éloignement qu'elle montre à s'en servir. Ce ne peut être que l'effet de cette inertie moral qui reponsse sans examin touttes les nouvelles inventions, les ternissant de la denomination défavorable 'd'innovations.' Les experiences faites à Meudon et ailleur ont montré évidemment les effets terribles des boulets creux, et leur immense superiorité sur les autres, que l'on peut, supposer qu'il ne reste aucun doute à cet égard. Il a été prouvé à toute evidence, qu'un seul coup de cannon chargé d'un projectile creux, pourroit mettre un vaisseau à trois ponts dans la necessité de capituler, pour sauver son équipage," &c. &c.

Now, this alludes to shells of the feeble calibres of 24-pounds and 32-pounds guns. What would this celebrated man of practical knowledge have seen and reported of shells of 8, 10, or 13 inches, that is, of 80, 150, and 200 pounders!! The fact is, I believe, that *Messieurs les Officiers de Marine*, are not such fools as we might take them to be! They have so pertinaciously persevered in rejecting the use of horizontal shells instead of shot, not because they are so pitifully ignorant of their tremendous effects, but because they fear those effects, and feel that when such means shall be adopted, "their occupation's gone," as a new system will be introduced, in which far less "seamanship" will be required.

Previously to ships of war being regularly armed with a small though efficient number of bomb-cannon, of the best calibre and construction, instead of being crowded with scores of guns, whose present effect is comparatively insignificant and ridiculous, it is probable that

lls penetrate soft stone and brick walls, as *lid shot. Yet the latter are always used* *ch works, and even against the works of* *besieging enemy!*

the smaller shells, or hollow shot, will be partially and experimentally tried from the guns at present in use. At least, such will be the proceeding of those naval administrations which possess not sufficient energy and discernment to seize *at once* upon a means of overwhelming superiority.

From the experiments made at Mendon, Vincennes, Strasbourg, Antwerp, Mentz, La Fère, &c. &c., and officially reported by the Generals of Artillery, Gassendi, Audreossi, Lariboissiere, d'Aboville, &c., it has been *fully proved*, that shells, even of the feeble calibre of 24-pounds (5½ inches) when fired *horizontally* into a ship's sides, inevitably destroy it in a few rounds. Indeed, it has been most decisively shewn, that *one only* such shell, lodging in the side of a ship, *not far from the water's edge*, must cause it speedily to sink. The explosion occasions a rupture, tearing, and dislocation of the timbers of many feet in extent. and *such as it is impossible to plug up*. It is also proved, that the stronger the ship, that is, the thicker her sides, the more certain is the effect of the shells thrown into it; inasmuch as they are the less liable to pass through. All such *facts*, and a multitude of others, must now be generally known; so it is to be supposed that upon the first occasion of a war, the contending parties will *at last* avail themselves of a means, which they must feel ashamed of having so long neglected. They will probably, as I have said above, provide their ships with a few shells, corresponding to the calibres of the present guns, and thus reluctantly creep, or rather be dragged into a system which none of them have had either the sense or the courage to avail themselves of at once!

A five and half-inch shell, that is of the calibre of a 24-pounder, weighing at least 18 pounds, as it ought to do for naval purposes, contains one pound of powder. Terrible as are the effects of this small shell, or rather hollow shot, on the timbers of a ship, they are but trifling when compared with those of the higher calibres, which must, in the nature of things, very soon come into use. If ships begin by using 24lbs., 32lbs., 48lbs., and 68lbs. shells from the existing artillery, it will be a great advantage to have the first exclusive use of other shells, which although of similar calibres have double and triple the power of the spherical ones at present known. Such I look upon to be my cylindrical percussion ones*.

It has often been suggested and attempted to throw projectiles of a cylindrical, ovoid, or other elongated forms, but without success; because, for such configurations to furnish *horizontal* ranges of the necessary extent and precision, it is absolutely indispensable that they should fly steadily head-foremost; that is, that the line of their longest axis should be preserved in exact coincidence with the line of flight, from the very beginning to the end of the range, as in the case of an arrow or rocket. Moreover, it is necessary such position should not be changed by the projectile making any number of ricochets on the water. I have succeeded in insuring these essential and fundamental conditions, in my cylindrical shells (figs. 2 and 3); and I con sequently recommend their substitution for the spherical ones, for *horizontal* naval use, at least as regards the calibres of 18, 24, and 32-pounders guns.

The cylindrical shells may be exploded either by percussion, or by the present method of fuses, but I certainly recommend the former; first, because the shell on my percussion principle can never explode either too soon or too late; whilst a fuse shell *may* not only burst too soon, at a very long range, but it may, at a very short one, pass through and through the enemy's ship without bursting at all. If it be suggested that a percussion shell may burst *immediately* upon striking the object, without having time to penetrate, I reply, that as far as I can judge from what I have seen, the penetration to the extent of a couple of feet, is as rapid as the ignition of the contents of the shell; but that, should it be desired, I can delay the explosion, and cause the shell *to hang fire* for any fraction of a second or for a whole one, or even two, at pleasure. Secondly, my percussion shell is more convenient and safe, in the filling, handling, keeping,

* The effect of hollow shot might be much increased by introducing into their bursting charge, a certain portion of *percussion* powder. Small shells for the field artillery might be rendered very powerful. Six-pounder field pieces would produce a far greater effect, were they to throw grenades instead of solid shot. I would suppress such pieces altogether, and substitute improved howitzers in their place, longer and stronger than the present ones.

and using, than the fuse one, *as commonly managed;* and the absence of the fuse, especially if not a metallic one, leaves somewhat more room for the powder *roche à feu*.

The cylindrical shells are of two different conformations; the one (fig. 2) containing about *twice*, the other (fig. 3) about *thrice*, the quantity of powder of a spherical shell of the corresponding calibres. The range is similar to that of the round solid shot of similar diameters, with the exception of the shell's ricocheing better and further upon the *water**. I propose constructing some of a third formation, about *four* times the capacity of the sphere. They will anyhow be useful at short ranges.

Should it be cited as an objection, that my cylindrical shells are two thirds heavier than spherical ones, I beg to observe, that that only makes them *one* third heavier than solid shot of their corresponding diameters; and that by increasing the weight of a projectile, *specifically* as it were, without augmenting its diameter or resistance to the air, *its power of range is thereby much increased*, as in the instance of more than doubling the weight of a shell by filling it with lead. With respect to any supposed injury to the guns, or inconvenient recoil, it should be remembered that case shot for field service are nearly double the weight of the round shot; that it is very usual in the navy, to fire grape and round shot together, and even *three* round shot at once; and that whatever inconvenience of recoil, &c., is experienced in the latter instances, is mainly caused by neglecting, when at such short ranges, *sufficiently* to diminish the charge of powder.

The *roche à feu* which I introduce into the shells along with the charge of powder, is of a new and much improved manipulation, or rather *principle;* and proves more powerfully conflagrating than that of any of the laboratories.

The only objection having any shadow of plausibility or common sense, that *Messrs. les Officiers de Marine* adduce against the use of fuse shells instead of shot in naval warfare, is, that "shells are highly dangerous *to those who use them* on ship board." In answer to this assertion, I can say, that I arrange common spherical fuse shells in such a manner, as to allow me to place one, filled with fuse and runners complete for firing, upon half a pound of powder strewed upon the ground. I will then set fire to that powder, remaining with my foot upon the shell. After this I will place the same shell in a tub of water for any number of minutes, and then, putting it into a gun and firing it off, its fuse will ignite and the shell burst as usual.

Here, therefore, is an end of the plea of danger to the crew who use fuse shells. With my percussion ones, I have said above, and I can shew, that *accidental* ignition is out of the question.

Approximate Contents and Weights of Cylindrical Shells.

Shell, formation A, Fig. 4

	For 24lb. gun.	32 gun.	8 inch.	10 inch	12 inch.	
Weight, when full..	30lbs.	44lbs.	95lbs.	200lbs.	320lbs.	2 Calibres in length.
Contents of powder	2lbs.	4lbs.	8lbs.	18lbs.	25lbs.	

Shell, Formation B, Fig. 5

Weight, when full..	30lbs.	44lbs.	95lbs.	200lbs.	320lbs.	2 Calibres in length.
Contents of powder	3lbs.	6lbs.	12lbs.	28lbs.	35lbs.	

Shell, Formation C, Fig. 6

Weight, when full..	50lbs.	70lbs.	135lbs.	320lbs.	450lbs.	2½ Calibres in length.
Contents of powder	4lbs.	8lbs.	16lbs.	40lbs.	60lbs.	

The 13-inch shells *filled with lead*, fired by the French from mortars *à la Villantrois*, charged with 60lbs. of powder, which at the seige of Cadiz, produced ranges of 6000 yards, weighed, shell 187lbs. globe of lead 9-inches, 139lbs.; total of shells filled with lead 326lbs.

My spiral shell of the *same calibre* and of equal weight, contains, *instead of lead*, 25lbs. of powder!

July, 1837.

FRANCIS MACERONI.

* *By experiments made at Antwerp, a 68lbs.* carronade was found at 3 degrees, to throw its shot *horizontally 8,400 yards with the charge of only 6lbs.* of powder. The corresponding shell ricoched so *much better than the shot, as to go 200* yards further, although of less specific gravity.

FORIEGN RAILWAYS.

(From the *Railway Times*.)

AUSTRIA.—On the 23d of December, the Railroad called " The Emperor Ferdinand's North Way," was to be opened from its Vienna termination in the Prater, the Hyde Park of the Austrian capital. The greatest interest was evinced by all classes in the approaching ceremomy, and it was expected the Emperor himself would be present. The Railroad is to be open on Sunday for passengers only, and the charges are said to be extremely moderate. In an experimental journey on the 18th, an unfortunate accident occurred. Two of the spectators incautiously remained too near the locomotive at the moment of starting, and one of them was carried away by the wheels. Both of his feet were crushed, and he expired in a few hours after.

SAXONY.—A minute plan of a projected line of Railroad, to be called the Saxony and Bavarian Railway, has just been laid before the Saxon Government. The great excess of the expenses of forming the Leipsig and Dresden Railway over the original estimate, has led to such general complaint, although that line is still considered likely to pay the shareholders well, that the Saxon Government has resolved, unlike the Prussian, to sanction no Railway for the future without a previous enquiry into the particulars of the project. The present Railway is to start from Leipsig, and pass through Bransdrof, Altenburg, Zurchau, Werdau, Moschwitz, Reinsdorf, &c., to Wiedersberg. It is esteemed a great advantage, that about the middle of its course it will pass near the coal-mines of Zwickau, which have been worked with great activity of late, and appear to be yearly increasing in importance and value. There is no doubt that this plan, or some similar one, will be approved, and in no great length of time a line of Railway formed, connecting the north and south of Eastern Germany.

ITALY.—The preliminary works of the Milan and Venice Railway are now being carried on with activity. The land-surveying operations, which were begun in the Venetian provinces, so long ago, as the 25th of August, were commenced in the Milanese, about the beginning of November. The levelling has been completed from Venice to Padua, and is far advanced in the neighbourhood of Vicenza. It is superfluous to remark, what facilities are afforded to the labours of the modern engineer by the general evenness of surface which characterizes the famous great plain of Lombardy.

Metropolitan Improvements.—Previous to the adjournment of the House of Commons for the holidays, Alderman Sir Matthew Wood, obtained the re-appointment of his Committee for considering and promoting the improvement of the Metropolis, of whose first report a full notice appeared in our pages. It is a pity the worthy Alderman will not confine his plans within the bounds of moderation; we might then hope for some useful result to his labours. Unfortunately, his schemes are so many, and of such different degrees of merit, that it is easy to throw ridicule on the whole, by selecting some of the more objectionable for remark, and sinking those of an opposite character. It must be admitted, that Sir Matthew displays a commendable degree of perseverance in the attainment of his object, but we fear his efforts in this case are as little likely to be attended with any brilliant success, as those made by him for the reforming of the manners of the cab and omnibus-drivers, for whose regulation the Alderman regularly brings in a bill every session, which never gets further than a certain stage, where it is overtaken by the rising of the House, which compels him to begin again *de novo* on the next meeting of Parliament.

Mechanics' Institutions in Wales.—The excitement of the public mind on the subject of Mechanics' Institutions, which was at its greatest height in England fourteen years ago, and then led to the establishment of institutions of the kind in nearly every large town in the kingdom, does not seem to have extended to " the principality." It is now just two years since the first Mechanics' Institution was set up in Wales, the town which had the honour to set the example being Aherystroyth, which, strange to say, is one of the most remote from the English border.

Steam Communication with India.—The plan is now in full operation, and has been found to answer admirably, notwithstanding some unavoidable defects, which might be expected to show themselves on the commencement of so extensive an undertaking. In spite of these, the trip was accomplished by one of the most recent mails in *forty-six* days. This speed will soon be improved upon when the arrangements have been more fully matured.

New Zealand Colonization Society.—Among the strange schemes for colonization now afloat, not the least remarkable is that for forming an extensive English settlement in the island, or islands, of New Zealand, one of the *advantages* of the situation being, that the savage inhabitants who at present compose the only population are not only exceedingly strong and exceedingly fierce, but exceedingly fond of human flesh! The arrival of a few shiploads of emigrants from England would doubtless be welcome to these gentry, especially if they begin to find that a population presses on the means of subsistence. One of the best ideas of the promoters of the plan is, that they wish to draw the funds for carrying it into execution, not from their own pockets, but from the English government!

LONDON: Printed and Published for the Proprietor, by William Angus Robertson, at the Mechanics' *Magazine Office, No. 6,* Peterborough-court, between 135 and 136, Fleet-street, in the Parish of St. *Bride, in the City of London.*—Saturday, January 13, 1838.

Mechanics' Magazine,

USEUM, REGISTER, JOURNAL, AND GAZETTE

o. 754.] SATURDAY, JANUARY 20, 1838. [Price 3*d*.

SHARPE AND ROBERTS'S DRILLING MACHINE.

Fig. 2

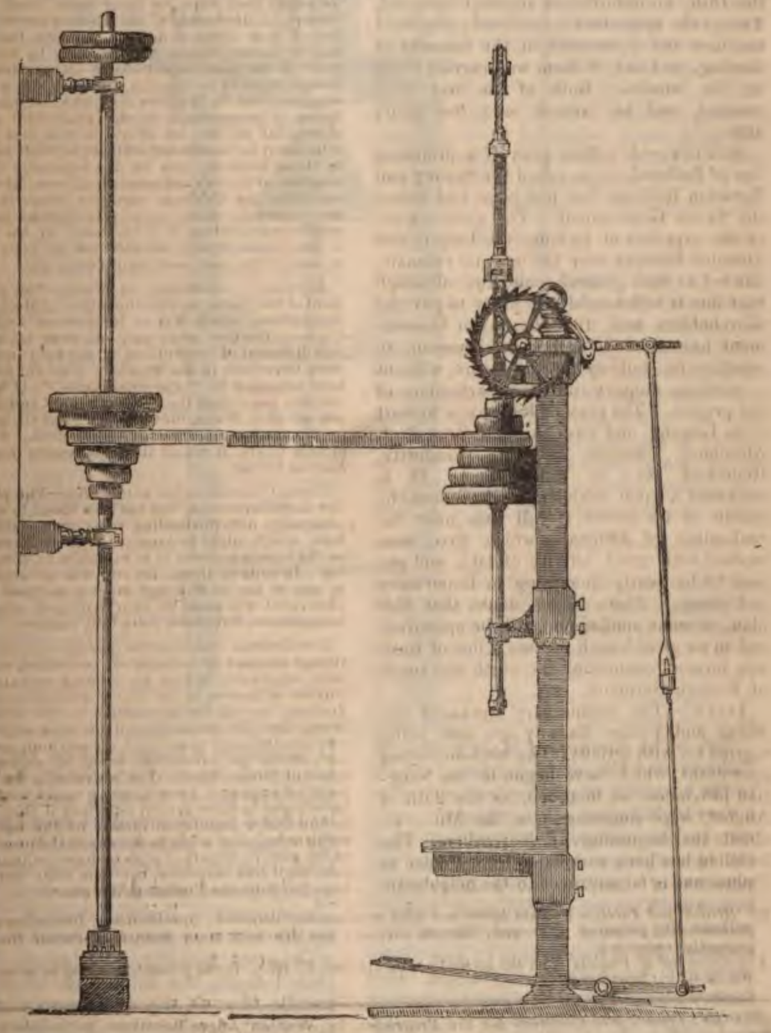
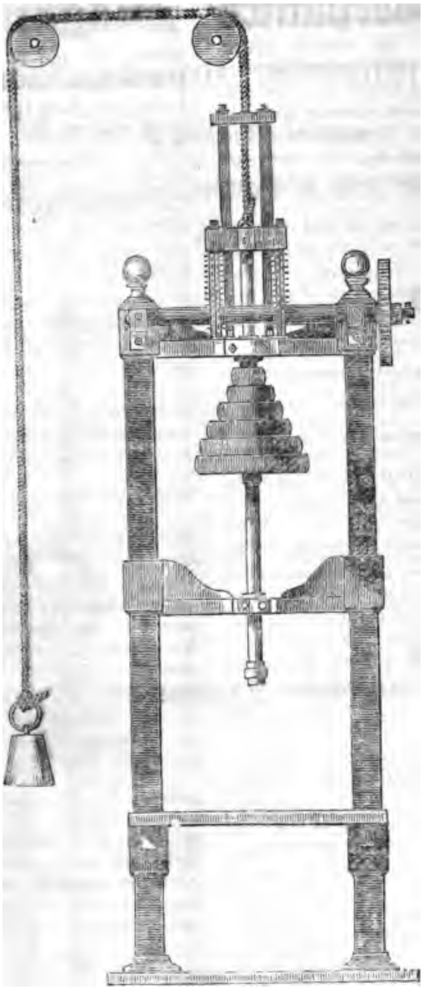


Fig. 1.



Sir,—The factory of Messrs. Sharpe, Roberts and Co., at Manchester, affords to the admirers of mechanical ingenuity, a very high degree of gratification. The numberless contrivances for facilitating the manufacture of machinery and apparatus of almost every description, evince such profound judgment and excellent knowledge of mechanical resources, that a description of any of the numerous machines with which that factory abounds, cannot fail to interest the student or mechanician. Among ther mentioned the drilling m ented in the front page. It consists of a frame-work of cast-iron, supported by two standards, between which is placed the drill stock, driven by a band passed round the speed pulley, the whole of which is carried by a cross head, attached to a cylinder by means of a chain passed round its circumference. The apparatus being put into motion by the steam engine, the drill revolves with great rapidity. The work being placed upon the table just above the treadle (fig. 2), the workman assists the operation, forcing the drill downwards by the depression of the treadle, which is connected by a rod attached to a lever

ing from the axis of the ratchet The ratchet wheel is furnished ro palls, which take into the teeth. epression of the treadle conse- r forces the ratchet-wheel forward nds the chain round the circum- of the cylinder, thereby drawing ing the tool downwards. The rbalance (see fig. 1), prevents ll from permanently resting on rk.

mproved machine of this descrip- lf-acting, has recently been con- d by Messrs. Whitworth and Co., chester, a description of which I for a future communication.

um, Sir, yours respectfully,

CHRISTOPHER DAVY.

nivals Inn, 13th Jan. 1838.

TING'S ASTRONOMICAL TABLES. —TO A SCOTCH DOMINIE.

—It was not my intention to have ny further correspondence with the subject of my Astronomical , as not a single element con- in them has as yet been proved to be erroneous. To use your nguage, you have been for some s past *nibbling* at them, but you not up to the present time been obtain a *bite!* You have been ually harping about my method of the *synodic* periods of the planets; gh I have given you no method. Cambridge Student, No. 745, p. 'It is very true, that Mr. Utting ven us no formula, or equation termining the synodic periods of anets!") I shall not enter into articulars contained in your last etters, I may, however observe, hatever information I might have ed from a *Norfolk* Dominie, I acquired none whatever from a one. In No. 747, p. 139, you een labouring very hard to dissect ethod by which I obtained the ats of my tables; but you are as stant in your conjectures as the is from the *Nadir*. You suppose I have manufactured the grand l of conjunction G of all the planets h a way, that G is an exact mul- *(or nearly so) of the* expression *where T and T′* are the mean *tropical* periods of the earth and planets. But on the other hand, if $S = \frac{P P'}{P \pm P'}$, where, P and P′ are the periodic or *siderial* periods of the earth and a planet; then you deny that in any case in the solar system that G is a multiple of $\frac{P P'}{P \pm P'}$. One would have thought from the superior knowledge that you have acquired of *Newton's Principles*, that you must have known that the above formulas, both of them, give the same result, the only difference between them arising from the motion of the equinoxial points, which varies *proportional* to the periodic times of the planets; consequently, both formulas must give the same result, of which, however, you were perfectly ignorant, as in No. 734, p. 366, you assert that, "in no case in the solar system is $\frac{T T'}{T - T'} = \frac{P P'}{P - P'}$; and these facts, Mr. Editor, are as well known to every one who has attentively studied the motion of the planets, as that 6 times 7 is equal 42." So much for scanning an algebraical demonstration! You remark, "that the whole matter in dispute about the conjunctions of the planets lies within the compass of a nutshell. All that Mr. Utting has to do, is to demonstrate that a mean *synodic* period of a planet is obtained from the formula $\frac{T T'}{T + T'}$; and if he can do so, I shall be the first to congratulate him upon this second wonderful discovery"! Now the result of the above formulas, being both equal, *each* to *each*, I am of course entitled to your congratulation! Again, you remark in a parenthesis, "I have said nothing of the conjunction of the satellites of Jupiter, &c.; that I may perhaps make the subject of another communication." Now were you capable of undertaking the task, and impartial in your decisions, I should not have the least objection to your so doing. In my Tables, (vol. xxvi, p. 378,) the *tropical* periods of the planets are given for this reason, because the period of eclipses inserted in the *Memoirs of the Astronomical* Society of London, vol. iii, p. 89, were previously deduced from *tropical* motions, one table being a multiple of the other, as far as relates to the solar and lunar motions. In regard to the

periods of the satellites, these were not computed until after those of the planets, and as the motion of the equinoxial points is not referable to the satellites (that of the earth excepted), consequently, siderial periods only are applicable to them. There is a wonderful coincidence between the periods of the satellites given in my Tables, and those given by Sir J. Herschel and Mr. Baily. In vol. xxvii, p. 416, I have established the probability that ten revolutions of the equinoxial points are performed in 250904 *solar* or 250894 *siderial* years. Hence my Tables may easily be rendered uniform by deducting ten revolutions from the number of revolutions in my first Table; and 1° 26′ 5″ from the secular motions of the planets in longitude in the last Table. The periods of the planets and satellites, and the motions of the planets in longitude, will thus all be adapted to *siderial motions*. For an account of my first discovery you refer to No. 650, p. 314, which was first inserted in the *Mechanics' Magazine* by its Editor, vol. vi, p. 32, abridged from the *Philosophical Magazine*, vol. lxii, No. 304. Whatever may be your opinion, or that of any other person, on the subject of my making this discovery, is of little consequence to me, I am perfectly justified in my own conscience in stating that I was at that time completely ignorant of its being a *corollary* from one of Newton's theorems, which Sir J. Herschel and Mr. Babbage stated it to be when presented to the Astronomieal Society. And as I am, at the *present time*, according to your showing, ignorant of *Newton's Principles*, or unable to *scan* algebrical demonstrations. You, of course, will allow me the merit of making this discovery! As it will not detract from your fame, it would have been a fortunate circumstance for you, if as much could be said in the case of my second discovery!

Now for your question, "whether the next conjunction of the Sun and Jupiter is to be considered a *siderial* synodic period, or a *tropical* synodic period?"

$$\text{First, } \frac{\overset{\text{sid. days.}}{4344.446881} \times \overset{\text{sid. days.}}{366.256384}}{3978.190497} =$$

399.9762 days = the *siderial* synodic *period*. (Vide Table, vol. lxii, p. 120, *Philosophical Magazine*).

$$\text{Lastly, } \frac{\overset{\text{solar days.}}{4330.643164} \times \overset{\text{solar days.}}{365.242244}}{3965.400920} =$$

398.8837 days, the *solar* synodic period; the time in the first period is measured by a siderial clock, that of the latter, by a clock adapted to mean solar time.

Solar and tropical are in same cases synonymous terms, and in No. 741, p. 37, *tropical* synodic period, was inadvertently inserted for *solar* synodic period. You say that you shall be most ready to admit any errors I can point out; I, however, challenge you to prove a single calculation correct that you have made, which disagrees with my Tables. You, Sir, seem to think arithmetic the *drudgery* of science. So be it,—it has always been my maxim to give my solutions in common arithmetic where it can be done, as I consider such practice more acceptable to the readers of the *Mechanics' Magazine* generally, than that of giving formulas only. It would have been no disgrace to you to have experienced a little of this *drudgery*. For had I been so inclined, I could have given formulas (although I deal so largely in common arithmetic!) for finding the synodic periods of the planets quite as well as you have done.

You say, that in Number 280 of the *Mechanics' Magazine*, I made rather an ill-natured attack upon Mr. Squire, of Epping. Now it so happened, that Mr. Squire first commenced the attack upon me; and what I stated in answer thereto was an indisputable fact. But the case is quite different in respect to your attack upon my Tables. The whole tenor of your observations has been to invalidate their correcness, by assertions and insinuations, and you have not been able to substantiate your allegations, although you have been endeavouring so to do for months past. In conclusion, I beg to thank you for your *serious advice* (No. 751, p. 213), and at the same time, wish to inform you, that I entertain no fear of my *scientific attainments*, sustaining the least injury from the effects of the shafts levelled at them by a *Scotch Dominie!*

I am, Sir, yours, &c.

J. UTTING.

Kings Lynn, Jan. 6, 1838.

TION OF THE ELECTRIC TELE-H.—GAUSS'S, RITCHIE'S, WHEAT-E'S, COOKE'S, ALEXANDER'S, DAVY'S.

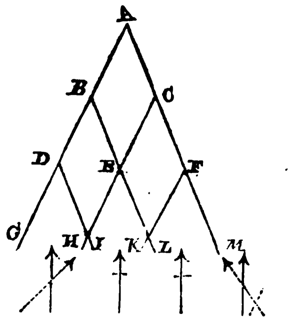
—It is too often the case, that the ity and valuable time of talented e wasted upon what has, unknown n, been invented before; and of have instances in the electrical ph.

apparatus of Mr. Alexander, is, not mistaken simply identical, or so, with a model constructed by Dr. Ritchie, about twelve years

experiments are said to have erformed in the last summer; experiments were performed, with le results, by Mr. Wheatstone, and ed in a paper by him in the phical *Transactions* 1834 or 1835. , the facts were pretty well known y persons even long before this.

improvement suggested by your ondent "Corpusculum," is an and a good one; but it is one which d not have patented, inasmuch as it ient in the essential of novelty. leaves much wanting to render n anything like a practicable one. ay be of some interest to your to be informed (by one who has l some time and attention to the ,) to what extent the electrical ph had previously been improved rs.

essor Gauss, of Gottingen, finding e magnetic force of an electric in one continuous line of con- was the same at every part of it, ed to give different signals, by ng a single magnetic needle at the extremity at different angles, ed by the energy of the current, s made dependent on the rapidity rting and removing a bar magnet l of the conductor at the near end. , as I understand, the discription Professor Steinheil, of Munich, en of his friend's proposal; but not point out an adequate means ating the delay which would occur n each signal, and the liability to acy, where a few degrees more in the angle of deflection would a totally different signal. Mr. *in conjunction with Professor tone, (who has long* been devoted *ical investigations)*, patented in *t, a contrivance* in which the combined action of two or more needles indicates the signal. These needles are astatic, and suspended vertically with horizontal axes. They avail themselves also of the temporary magnetization of soft iron to fix the needles, obviate vibration, and increase the energy of the instantaneous deflection. Each needle when deflected, points along an inclined line, which intersects a corresponding line from each other needle; a letter of the alphabet being marked at each point of intersection, so that the letter to which two needles simultaneously point (as represented by the dotted lines,) is the signal, which would in the diagram



appear to be C. In this manner, to the best of my recollection, with five or six wires they are able to give about thirty signals. Each needle has of course two motions, effected by reversing the electric currents.

In a telegraph invented by Mr. Davy, the external appearance is different. With four wires, more single signals than enough for the letters of the alphabet can be given. In the model exhibited at the Belgrave Institution last month, six wires were employed; by which nearly 200 single signals could be given; each following the other with exact precision, and almost unlimited rapidity of succession. In some instances whole words were given in single signals: though it did not appear that this could always be done. The internal arrangements of this apparently admirable invention were not displayed; whether they consist in an improved modification of Gauss's plan, or a different mechanical application of the principle last described, or whether essentially different from either, the details will doubtless be made public in due time; but until this is the case, it will perhaps be impossible fairly to esti-

mate their comparative merits. I am assured there would be little difficulty in constructing such an apparatus as would set up printer's type ready for printing; but the mechanism would be somewhat expensive.

It is understood, that Mr. Wheatstone, Mr. Cooke, and Mr. Davy, are all acquainted with some means (whether identical or not,) whereby the carrying on of the communications is rendered totally independent of distance, be it what it may, without the necessity for intermediate renewing stations, whether for ten or 10,000 miles. If this be the case, a striking feature in these inventions will be their great cheapness.

The keep of horses, and the fuel of the steam engine, are serious considerations; but the galvanic battery is easily provided for. A few ounces of zinc and blue-stone for its food, and as much oil of vitriol per week for its drink, constitute its diet. It would surely pay a Volta-Telegraph Company right well, to send short communications for private individuals at a lower rate than the present postage between distant parts. Now, Mr. Editor, can such an invention be indifferent to the political, the scientific, or the commercial world? What shall hereafter prevent our globe from having sets of wires laid down, branching in all directions over its surface, like the nervous system of the human body, and thus having as it were, but one pervading soul?

What shall then prevent a patient ill with the cholera in India, from procuring (per galvanism) the advice and prescription of Sir A. Cooper, in England, and acting thereupon within an hour of the attack; indeed, (if Sir A. be not at dinner, and otherwise disengaged) within three minutes? Then will the Sydney Gazette contain in this day's paper a full report of last night's debate in the British House of Commons, and the scattered members of a family settled apart on the four quarters of the globe, may hold daily converse. Indeed, half the valuable time of the world will be saved.

If the mind of man, or rather his thoughts, his wishes, his orders, can be *transmitted quicker* than light, *1000 miles in an instant,* what, though his "*corpus*" or "*corpusculum*" remain *located on the spot,* whereabouts as a corpse it will eventually be intered? There he has his wishes fulfilled; his orders executed—electricity is his unloitering courser.

From New York to Pekin, from Pole to Pole, man will be enabled to converse with man, as though in the same house, in the same chamber; it will be one step towards making all nations as one family.

I am, Sir, your obedient servant,
A constant reader,
INQUISITIVUS.

January 5, 1838.

SIR G. HEAD'S SECOND HOME TOUR.

It is well that Sir George Head claims Kent as the place of his birth in the very volume before us,* or he would be set down by most readers for a native of the sister-kingdom, on the testimony afforded by the contents of this work alone. A year or two back, Sir George favoured the public with "A Home Tour in the Manufacturing Districts;" his new production purports to be a "continuation" of his former, and yet (spirit of St. Patrick!) its pages refer entirely to a Tour, or rather Tours, "begun, continued, and ended" long *previous* to the date of the peregrinations already recorded!—somewhat on the plan of Thady O'Blunder's History of England, "from the earliest times to the passing of the Reform Bill, with a *continuation* to the invasion of Julius Cæsar." After all, it is only "putting the cart before the horse," or, in railway parlance, "the train before the engine," which in these march-of-science times is done every day in the week, and nobody any the worse. If the thing answers in locomotion, why not in literature?

Our author's former volume, as it referred to the district in which railways were first introduced, and to a very recent period of time, contained a good deal of matter relating to railway travelling. In the present instance, he has more to do with the sea than the land, and consequently, more with steam-

* A Home Tour through various parts of the United Kingdom, being a continuation of the "Home Tour through the Manufacturing Districts," also, Memoirs of an Assistant Commissary-General. By Sir George Head, author of "Forest Scenes and Incidents in the Wilds of North America." London. Murray, 1837, 8vo., p. 367.

than steam locomotives. His tour
ost entirely an insular one; it com-
es in the Isle of Man,—or rather
arrative does, for whether the tour
ve have no means afforded us of
ing. The very date of his visit to the
s suppressed, although, from some
ons to then-passing events, it may
esumed to have taken place in the
1832. Sir George's account of the
ving accidents" which befel him in
uarter, are by no means particularly
sting. The model on which his
is formed, or attempted to be form-
the "Bubbles from the Brunnen"
brother, Sir Francis,—the present
rnor of Upper Canada; we cannot
owever, that our author has caught
pirit of the original; we perceive
of the quaintness, indeed, and not
e of the rather offensive courseness
e *head of the Heads*, but his close-
f observation in every-day matters,
is occasional felicity of description,
lmost entirely awanting;—not so
mplacent self-sufficiency and prag-
al pertness, which glare out upon
eader in almost every one of the
in his *doppel-ganger* of wit and
ness, the specimens are of a very
second-hand order; and it is al-
needless to observe, that so very
ory a traveller adds very, very little
e existing stock of solid informa-

m Mona our outhor proceeds per
-boat to Glasgow, and thence by the
mode of conveyance, to the Scottish
ands and Islands. His account of
delightful trip" is by no means
ing. We extract a page or two
the part describing its commence-
both on account of the view it
s of the present state of steam
yance in a locality where its ad-
ges have been most highly spoken
d of its constituting a fair speci-
f Sir George's style of descriptive
ing:—

t half-past eight o'clock in the morn-
fter making way with much difficulty
two or three other vessels that lay
the quay, I finally succeeded, by
g along a rough plank, in getting on
the steamer. The morning was more
sually cold for time of year, and a
ale *blew steadily, directly* a-head of
up the river; so far was unfortunate;
ld I was on board the "Maid of
" *I could hardly* give credit to the information, such was the scene of dirt and confusion, such the quantity of packages, and the mob of owners wrangling about stowage, that disturbed the thoroughfare. A few quarter-deck passengers meanwhile stood disconsolately regarding each other as if lamenting the untoward fate that had brought them together, each unable for a moment to stand still, without being molested, or molesting others. A multitude of poor folks from the Highlands, busily arranging their own property, jabbered together in Erse so loudly and fluently, that the captain, unless shouting at the full extent of his lungs was unable to make himself heard. The "Maid of Morven" was a very Cinderella in her working dress, as black as a Newcastle collier, and crammed full till she rolled with stores and packages of every description. There were sacks of oatmeal and barley, sugar-hogsheads, crates, deal-cases, trunks and band-boxes, stores, frying-pans, scythes, hoes, and sickles; besides all sorts of agricultural implements and hardware. Among the fore-deck passengers were lads and lasses from the mountains, shepherds with long poles, and plaids folded across their shoulders; especially, as is usual among crowds under the most forbidding circumstances, plenty of mothers with young children.

"When the hour of departure, protracted to an unusual period, at last arrived, the authority of the captain was seriously exerted to oblige the shore-people to conclude their leave-taking and quit the vessel. Several, as no other argument would suffice, he finally pushed out by head and shoulders. When we began to move, it was at once evident the vessel was grievously ill-trimmed and top-heavy; in fact she reeled and swung from side to side, as if really about to rest on her beam-ends; whereupon the captain filled his nostrils with snuff, disposed of the crew in the way of equilibrium, and placed heavy plugs of iron on the deck to serve as ballast. In spite of all these measures, always a heavy mover through the water, and furnished with an engine weak in proportion to her dimensions, she was considerably weighed down by the head, and sensibly quivered by the concussion of the waves. Meanwhile the more lively craft overtook as with the utmost facility, as we tardily weathered the head swell, and others meeting us with wind and tide in their favour, flew upwards before the gale with inconceivable rapidity; a confused semblance of forms and features in a row along the bulwarks, joint property, as it were, of a string of tall, upright, staring figures, ranged in order for inspection."—p. 100.

This statement, which may perhaps be rather exaggerated, gives but an un-

pleasing idea of steaming by water *as it is*—or rather as it *was* at the unknown period when our author encountered its perils. Unluckily, too, the hilly nature of the ground does not afford much scope for railway speculation in that quarter, or the more solid element would soon carry the day against its fluid competitor. But the Highland tourist need not despair; who, in these, our days of wonders, shall venture to prophecy that an adventurous company shall not ere long—at an expense of a few odd millions—drive a railroad through the heart of the country,—level the Trosachs,—bore a tunnel through Ben Nevis,—cross Loch Lomond by a "stupendous viaduct,"—and, if required, drag a whole train of sight-seeing cockneys—fresh *that morning* from Cheapside and 'Change) to the top of "Scotia's monarch of mountains" by the aid of a stationary engine! Twenty years ago, the present steam-boat system could hardly have seemed more visionary!

From Scotland our author whisks us, without notice, or at all "condescending on particulars," to the Island of Guernsey, which, however, only furnishes materials for a short chapter or two, of no very high pretensions; after which the reader finds his erratic conductor on a sudden staring at the Shannon over the bridge of Athlone, though how, why, or wherefore, the change of scene has been effected, he cannot guess. Ireland is a rich mine for the painter of manners, but Sir George Head soon throws aside the brush. He pauses only to give a sketch (which is spiritedly done) of a performance by a wandering troop of equestrians at Athlone,—another of his ride per mail to Galway,—and a very poor daub of the very Hibernian doings at the hotel there,—and then, apropos of nothing, brings his labours to a conclusion; except that, after the end of the book, we are presented with a *continuation* of the "strange eventful history" of the writer thereof, in the shape of a long prosy account of his doings in the Peninsula, in the earlier part of his life, as an Assistant-Commissary-General. This has no more connexion with the "Home Tour" than Sir George Head with true humour,—but it serves to thicken out the volume as well as better matter.

Our author is generally very minute in his descriptions of the mode in which he travels. We have seen his [p] of a Highland steamer; here fol[lows] pendant to it, a caricature of the [start]ing of an Irish mail coach :—

"Without the testimony of one['s] eyes and ears, it is quite impossible [to] comprehend in mortal imagination th[e] and hubbub attendant on the departu[re] Irish mail-coach, at its fresh start, c[onsist]ing of sounds and words different alt[ogether] and in intonation from those produc[ed] delivered by any of our English d[rivers] rather indeed resembling more close[ly] shouting of a Smithfield drover amo[ng] adverse commingled flocks of black- cattle. Mr. Connor blew the horn, a[nd] driver urging his cattle instantly [to a] gallop, continued to crack and ply hi[s] with utmost force, moving his arm a[nd] like a scaramouch, and hollooing in a [] peculiar, after what I have already s[aid] attempt to describe. In vain did th[e] horses, stung to a degree of violent [] ment by unceasing flagellation, flin[g] heads high in the air, and rolling ar[] ing, now on one side of the road, an[d] on the other, wince, flounder, and bol[t] paces long, others shrot, the chains r[] and the coach itself meanwhile sw[] bumping, and pitching tremendousl[y] did the minister of torment hover o[ver] ill-fated heads of the poor horses, a[s] Olympian Jove brandishing his th[under]bolts, or, an ancient Roman in a c[hariot] race imparting still-increasing action [to] fervid wheels, seem as if determined [to find] out, by actual experiments, the exac[t] or maximum of endurance of life and [] of iron, wood, leather, bones, and [] But the too profuse expenditure of [] power seldom lasts long: so, as m[ight in] due course be expected, our pace, soo[n as] we were clear of the town, at any rate [before] we had proceeded one mile, dwindle[d] to the trot."—p. 196.

This short extract displays a [] deal of our author's manner, esp[ecially] his excessive incorrectness, and [] effective extravagance of phrase[] attempts at humour are generally [] same laboured style, and seldom [] fortunate; he has no idea of the e[ffect] of those "quiet touches" which [] well in the handling of a th[] artist. He has certainly some ta[lent] for observation, but his powers o[f deli]neation are extremely limited. [] subject is one which gives the [] scope for talent; there is "ample [room] and verge enough" in the litera[] for scores of "Home Tourist[s]" genuine pretensions than our []

ead possesses, and we hope the field ll not long remain unoccupied. A good ur through the three kingdoms, with especial view to the existing state of e social and commercial relations of various communities, is one of the eatest *desiderata* of modern literature, d the sooner it is supplied the better. r George Head's two volumes go but very, very short way towards it.

OUBLE RANGE CARCASS OR SHELL ROCKET FOR DISTANT PARABOLIC PROJECTION, OR FEU VERTICAUX.

(Being No. 4 of Col. Maceroni's papers on Projectiles, &c.)

Fig. 1

Fig. 2

Sir,—I present this projectile, not as one that will produce any important change in naval or military affairs, but rather as something new and *somewhat curious which may on certain occasions, e made available.*

Previously to my becoming acquainted

Figs. 3 & 4

Fig. 5

with the qualities of the reinforced and

lengthened howitzer of Col. Villantrois, I flattered myself that my double range rocket possessed a power of range *far* greater than any morter hitherto used.

In 1823, I saw at Cadiz, upwards of twenty of those howitzers similar to the one set up in St. James's Park, but I have reason to believe that their great range was chiefly attributable to their shells having been *filled* with lead, by which their explosive effects were lost.

I denominate this rocket "*double range*," because I have found the means of projecting it without stick from a mortar, howitzer, or carronade at 45 degrees or other high angle of elevation, from the impulse of which in the first instant it ranges like a shell. During this flight the rocket is itself quiescent, but when arrived at nearly the turn of the parabola, a well regulated fuse ignited by the charge of the mortar, fires the rocket which *then* performs *its own range*, which beginning from such a height is greater than it would have been, if fired in the usual way from off the ground. Taking, therefore, the range derived from the mortar at 3000 yards, and that of the 32lb. rocket at as much more, we shall have a total of 6000 yards. The range of Col. V.'s 10-inch mortar at 35 degrees, loaded with 50lbs. of powder is 5,500 yards. The range of this rocket is as true as that of a shell.

From not having had at the proper moment at my disposal, a *bouche à feu* of sufficient dimensions, I have not been able to throw rockets on the above double range principle of more than half a pound weight. On the first opportunity I shall construct some 24 and 32-pounders which will require a mortar or howitzer or carronade of at least 8-inches calibre to project them.

It certainly may be regarded as of some advantage to be able to procure a very extended range for the purpose of bombardment by ships of war, without the incumbrance of pieces weighing with their carriages from 15,000 to 20,000lbs.

A 68-pound carronade weighing only 3,700lbs. or a field 8-inch howitzer which weighs still less, will throw a 32lb. rocket as far, or farther than the Villantrois mortar will send its shell filled with lead, *while the rocket* head will contain 12lbs. *of roche à feu or* of powder for explosion. *The shell* will *certainly* have the advantage *of superior* weight in its vertical fall upon casemates, buildings, &c., but a 32-pounder rocket will break through any ordinary roof, and have the full effect, either of conflagration, or explosion, which such a shell has not.

FRANCIS MACERONI.

March 1824.

Explanation of Engraving.—Fig. 1 is a common Congreve carcass rocket, with a serrated rim of iron riveted round the vent end.

Fig. 2 is the formation of the wings of sheet-iron, these should be composed of six or eight vanes. I have drawn only three to make the construction more clear.

Fig. 3 and 4, the rocket placed in a drum of beech seive wood or sheet-iron, attached to a wooden iron-armed bottom E, with a small hole ($\frac{1}{8}$-inch) for the passage of the quick match F. The wings are placed over the rocket; the vent is closed by the double cap D, traversed by the regulated fuse which burns five, six, or seven seconds. Within the cap D, is one dram of gunpowder, in order to blow it off from the vent of the rocket, on which it is cemented with putty or wax and rosin. The upper part of the cap E, is so formed as to prevent the igniting powder penetrating too far into the rocket, which *might* cause it to burst, as happens sometimes upon a portfire being thrust too far into the vent. The dram of powder blows off the cap D, so that the fire of the rocket has only to expel the piece E, which has no adhesion like the under piece.

The rocket with its wings, case, and strong-bottom, as in fig. 4 and 5, being placed in the mortar, carronade, or howitzer, is fired off with a small charge, (say 3lbs. to a 32-pound rocket.) The *bouche à feu* being fired, the bottom and case are blown to pieces, when the rocket being the heavier body, passes through the collar of the wings, which on the instant assume the position shown in fig. 5. The fuse is ignited by the propelling charge through the little hole in the bottom or *sabot*. The wings being placed with a very slight diagonal direction, causes the whole to revolve on its axis like an arrow or rifle ball, and trebles their directing effect. Arrived at the apex of the curve of the parabola, the fuse ignites the rocket which then performs its own inherent range, in addition to the one it has received from the mortar or carronade.

we found this plan to answer with rockets, so that there can be no of the like occurring to large ones. double the length of the wings, if ll, by causing flat wooden ones to own groves in the iron ones. But found the latter to be sufficient, ly, in consequence of the spiral n.

F. MACERONI.

h 12, 1825.

. Strong tin vanes let into the ends sticks of field rockets, give them the flight of an arrow or rifle ball, the effect of wind. But this plan its or inconveniences the discharg- e rockets from tubes, and perhaps efficiency of rockets depends on umbers simultaneously discharged, precision of aim is not regarded by ers of that excellent weapon, which, ay, will supercede all other projec- on land and sea. F. M.

r desire of a Correspondent we n a translation of the paragraph in h, from the memoir of General ville on the effects of hollow shot, d by Col. Maceroni in his third on projectiles, inserted in our last ber. We take blame to ourselves eglecting to do so at the time, especially as the practice of inter- g English composition with un- ated scraps from other languages, been so often reprobated in the of the *Mechanics' Magazine*.

Then the prodigious effect of hollow bursting in the side of a vessel is dered, one cannot help feeling asto- d that the navy has not hastened eagerness to make use of them. What e the motive of the unwillingness n to the adoption of the improve- ? It can only be the effect of that l *inertia* which rejects without exami- n all new inventions, branding them the opprobrious name of innova- . The experiments made at Meu- and elsewhere have so plainly de- strated the terrible effects of hollow and their immense superiority over hers, that there cannot remain the ow of a doubt on that subject. It een most satisfactorily proved, that single fire of a cannon loaded with a w *projectile, would reduce* a three- *d vessel to the necessity* of capitu- *in order to save her crew*."]

POTTER'S GUNPOWDER ENGINE.

Sir,—I have just seen your monthly part for December, and beg to trouble you with a few words on "Potter's Gunpowder Engine," an account of which appears in number 748, with a woodcut in the front page.

It must be evident to those who have knowledge of electricity, that the gunpowder could not be exploded by the arrangement represented in the drawing; because the "strong metallic globular vessel" being connected both with the positive and negative surfaces of the Leyden phial by good conductors of electricity (the wires,) would prevent the phial from receiving a charge from the electrical machine, the electricity being carried off by this connection of good conductors as soon as it is developéd; and consequently no spark could be obtained in the cup provided for the reception of the gunpowder.

To explode the gunpowder in the cup, all communication between the wires and the metallic globular vessel must be cut off, by the interposition of some substance which is a non-conductor of electricity, such as glass; this end I think might be obtained, by the wires being inserted into those lumps of glass commonly designated bulls' eyes.

Hoping this will not be deemed impertinent, I beg to subscribe myself,

Your's obediently,

SCIOLISTERUS.

January 15, 1838.

ADAMS'S EQUIROTAL CARRIAGES.

Sir,—At the time you reviewed my work on "English Pleasure Carriages," the novel principles of construction, might by many who had not well considered the subject, be deemed problematical, or at best only to be vouched so far as experiment could vouch, and wanting the sounder test of general experience; thus correcting the errors incident to the small range of circumstances usually connected with experiments.

At this lapse of time since that period, general experience has confirmed the accuracy of my experiments. Four-wheeled carriages with equal-sized wheels have been running both in London and its neighbourhood, and also in Scotland where the roads afford a severe test. One

of them was exhibited at the Annual Meeting of the Agricultural Society at Dumfries, and the accuracy of the principles generally acknowledged, by a body whose perceptions as to the importance of making savings in draught are amongst the keenest in the community.

I have not yet had an opportunity of instituting exact experiments as to the amount of saving in draught compared with common carriages serving the same purposes, but I am satisfied from the various observations I have made, that it will be found r wards of twenty-five per cent. When I have completed my experiments, I will forward you the particulars.

Of course all new inventions must clash with existing invested capital, and like most inventors I labour under the difficulty of exciting trade enmity to my inventions. This excites no surprise, for no man likes to have his capital unexpectedly depreciated; but it is unwise to expect to keep down a new invention by untrue statements. If a thing be intrinsically valuable, it will find its way to the public, if not, it will disappear. One carriage builder tells his customers that " the equirotal carriages will not lock"—a second says, " they will do very well on level ground, but they will not go up hill"—a third says, " that the hind part of the carriage will tumble about in the gutters uncontrollably," the fact being, that the hinder wheels are as much under controul of the horses, as the front ones, when the hinder parts of common carriages are really uncontrollable—a fourth says, " the springs will break all to pieces."

An answer to this last objection may be found in the fact, that a pair of the springs have been applied for a considerable time to one of the new carts, built after my design, for the " Parcels Delivery Company." There can scarcely be a severer test than this, running constantly over the stones, with a number of light loads and heavy ones, and driven with great speed. The cart with the bow springs was found so superior to the common ones, that the drivers became immediately emulous which should use it. It has been constantly sent on the hardest and longest journeys, and is *a universal favourite;* because, the drivers *sit easy, and the horses do the work without difficulty,* which is not the case with the other carts on ordinary springs. The men remark, in answer to any question as to draught,—after their rough fashion,—" It runs ten hundred lighter than the others." The appearance of the cart at present indicates the service it has performed; like a ship after a battle, the shaft-points broken, the steps torn away, the wheel hoops driven in, the tires worn out, all in as battered a condition as can be imagined, yet with the springs perfectly uninjured. I mention these things to show that it has not been holiday experiment, but bona-fide *work* by which the springs have been tested.

A cab which has been constructed for the streets on the same principle was tried by a cabman with one of his own horses, and he pronounced it "the easiest following thing that ever went behind a horse."

The fact is, the springs play through their whole length, and being universal in their action they elude concussion in every direction in which it can approach. The wheels can yield to obstacles with the axle, without the superincumbent weight being displaced, and this is the reason of the great saving in draught.

I need not dwell upon the importance of this feature of the invention, not merely as regards my own advantage, but the community in generally. If my mode of construction be a saving of 25 per cent. in draught power, it is equivalent to one horse in four throughout the community. With your permission I propose in a series of communications to show how existing four wheeled vehicles may be converted to my plans, and also to show how far they are applicable to railroad transit, in which avoidance of weight and friction, connected with unusual speed are quite as important as on common roads. It is a desirable thing that the whole subject of locomotion should be thoroughly discussed, and while contributing my own share of results to the general stock, I trust that some of your scientific readers will also address themselves to a task which must be a public advantage. I shall be better pleased to learn than to teach, for the results of many brains will thus help to swell my own stock of knowledge.

I remain, Sir, &c.

WILLIAM B. ADAMS.

159, Drury Lane, Jan. 16, 1838

ASPHALTIC PAVEMENT.

gave a general notice of this new pav- nposition in our 752nd number. The ıg are additional particulars, which ın from a pamphlet published by W. Simms, C. E., late of the Royal atory, who was engaged professionally Paris, to examine the mastic, try ex- its, &c., and to report whether it was for the same purposes in this coun- fter having made a rigid inquiry, m several engineering and architec- orks, where it had been applied, and d certificates from several of the minent engineers and architects in who highly approved of it, he did not to recommend its introduction into intry.

asphaltic mastic of Seyssel, when d for use, is a compound of two mi- ıbstances, one is the native asphalte, er is bitumen; the proportion of the in the amalgam is ninety-three cen- and of the latter seven centimes. phalte is extracted from the mine in and reduced to an almost impalpable before it is mixed with the bitumen. ter, as extracted from the mine, is oken into pieces of about the size of these are put into boiling water, and ticles which rise to the surface are l by boiling for twenty-four hours; ult is, the bitumen to be mixed with verized asphalte. The combination e two substances form the mastic or , which, being reduced to a fluid y the application of caloric, is poured oulds of any shape required; or in ate used as cement in hydraulic &c. The use of the bitumen ap- o be the giving of ductility to the ; and if a very minute quantity of r be added, the mastic will become nd partially brittle. The genuine possesses the hardness of stone, and serves a certain elasticity. When s pavement for terraces or footpaths, ars to resist the wear equally well ranite, and when prepared in the now adopted in Paris, it is difficult tinguish it in such situations from one. One of the finest specimens ing, and which at first sight has the ance of granite, is that on the north the palace and gardens of the Tuille- t is about eleven hundred yards in and ten feet wide; it is composed of haltic mastic, and the joints which ely cross it the whole breadth, and at *present appear to divide* the pave- *ito a number of large* equally-sized *re disappearing by* the mastic be- *more dense from* the tramping of feet, so that this extensive piece of pavement will soon appear, from end to end, like one immense sheet of stone.

A few minutes after the mastic has been spread in a fluid state, it again takes its natural density, which is such, that at the heat of 30 degrees Reaumer (equal to 300 degrees of Fahrenheit), it resists all impressions from an ordinary force. Its extensive application to the covering of buildings instead of tiles, slates, or lead, have induced the trial of experiments in France, by which it was ascertained that it is anti-electric, a property which it is desirable that all bodies should possess that are employed in roofing. Its application also for the flooring of halls, passages, and apartments, is in no way dangerous on account of fire, as it is not inflammable, the quantity of pitch which it contains being so very small. For the floors of underground kitchens, &c. it is particularly applicable, it being warm, and keeps out all damp, as well as vermin and insects, which are frequently so abundant in such places. When employed in the construction of water-tanks or reservoirs, it imparts neither taste, smell, nor colour to the water it contains.

Preparations are now making for applying the asphaltic mastic of Seyssel on a part of the Greenwich Railway, with a view to preserve the arches of that extensive viaduct free from damp. Also as foot-pavement in several of the metropolitan parishes, and in one of the principal streets of Liverpool, &c. The British public will, therefore, soon have an opportunity of judging for themselves of the utility of a material which is held in such high estimation by their continental neighbours.

The introduction of this substance into this country is due to R. T. Claridge, Esq., a gentleman who has spent much time on the continent, and who has obtained from the company at Paris a contract, whereby they agree to supply this country with the produce of their mine at Pyrimont, through him only.

The *Bulletin de la Society Geologgie de France* says, "Many works have been executed in Paris and its environs with the mastic of Seyssel; for instance, the footpath on the Pont Royal, and that of the Louvre; trials which have so well succeeded that the authorities of the city have decided to adopt the same material for the footpaths of the streets, also of the Place de la Concorde (formerly called Place Louis XV.), which is about to be laid out on an extensive and grand scale. The magazine of provision at Bercy has been covered for upwards of a year with this mastic, and succeeds perfectly. In the years 1832, 33,

34, this mastic was with equal success employed in the construction of the military works at Vincennes. It has also been successfully employed in the military construction of Donani, Besançon, Bourbonne-les-Bains, Grenoble, and Lyons. In the last city, all the covering of roofs and the interior areas of the new forts have been constructed with it. More than forty years ago, at Fort l'Ecluse, a small building was covered with this mastic, which has ever since continued in a perfect state of repair.

"The asphaltic mastic, the nature of which now begins to be generally understood, will render peculiar advantages in architectural constructions."

RAILWAYS IN FRANCE.

(From the *Railway Times*.)

This enlightened, and in general enterprising country, has hitherto displayed a singular apathy on the subject of Railroads, and allowed itself to be outstripped by many kingdoms of the Continent, which do not enjoy so high a scientific reputation. According to a recent statement in the most extensively circulated of the French newspapers (the *Constitutionnel*), there are at present but three railroads in France in full activity. A double line has been established between Lyons and St. Etienne, distance of thirty-four miles, but on account of the lightness of the rails, it is only fit for the transport of light weights. In order to obtain the most favourable gradients, there are no less than twenty tunnels on the line. One of them is a mile in length; another, the length of which if half a mile, is carried under the bed of the river Gier. The railway passes over the Saone by means of a viaduct. On part of the line the carriages are moved on inclined planes by means of their own gravity; in other parts locomotive engines are in use. The second railroad, that from St. Etienne to Roanne, about forty-five miles in length, may be considered a continuation of the former; it has only a single pair of rails. The Paris and St. Germain Railway completes the scanty list.

A commission which was lately appointed in the department of the Meuse to examine the projects of a railroad from Havre to Strasburg, and a canal from the Meuse to the Rhine, has given in a report approving of both, but recommending that if the two plans cannot be executed at once, the preference shall be given to the railway. The *city of Havre is also* warmly soliciting from *the government* the construction of the *long-talked-of railway* from Paris to the *British channel*: a subject on which a letter has likewise been addressed to the Minister of Commerce and Public Works, by M. Berigny, deputy for Dieppe.

It will be remembered, that when a privilege was granted last year to Mr. Cockerill, for the constrnction of a railway from Paris to Brussels, the inhabitants of St. Quentin, which was *not* to form part of the line, got up a petition to represent how fatal the circumstance would prove to the manufactures of the place; observing, that "the total ruin of St. Quentin would be the result, and this would form the greatest sacrifice yet offered on the altar of alliance with England." The Chamber of Deputies, infected, it appears, with the suspicion that Mr. Cockerill, who has raised a colossal fortune by betraying the manufactures of his country to foreigners, was now acting on a principle which he has all his life undeviatingly sacrificed to self-interest, caused the privilege to be suspended; and the question whether the railway is or is not to pass through St. Quentin is still undecided. On Sunday, the 24th of December, a meeting took place at that town of delegates chosen by the municipal councils of eleven towns in the vicinity. The Mayor of St. Quentin took the chair, and resolutions were unanimously passed to the effect that the railway ought to take St. Quentin its line, for reasons "political, commercial, and economic."

LONDON AND BLACKWALL RAILWAY COMPANY.

At an extraordinary general meeting of the shareholders of the company, held yesterday, the report of Messrs. Stephenson and Bidder, recommending the use of two stationary engines to work the trains instead of locomotives, was adopted. We extract the following from the report:—

"If the stationary steam-engine system be adopted, we should recommend that the engines be placed at or near to the Minories in Londen, (of 250 horse power,) and at or near to Brunswick-street, Poplar, (of 200 horse power,) with ropes extending between these two points, leaving the spaces between the Minories and Fenchurch-street, at one end, and between the Brunswick-wharf and Brunswick-street at the other (which are composed of curves of small radii), to be worked in one direction by momentum and in the other by gravity, as at present exemplified in the London and Birmingham Railway, at Euston-square.

"The ropes would be wound round drums of a large diameter; and we should propose to work this line by what is called a tail rope; that is, a rope attached to the train, by which it is drawn on the return journey

n fact, a rope will be always extended ole length of the line between the ss and Brunswick-street, Poplar.

r this arrangement carriages can be d or detached, at any intermediate f the line as well as at the termini, he same principle that the trains on ndon and Birmingham Railway are d to the rope on the extension of ilway to Euston-square.

pability would thus be afforded to mpany of increasing their interme-ations, when their depot establish- properly organised, and sufficient nent in point of traffic has been as-ed to render it desirable. By means stationary engines and ropes disposed way before specified, the taking on es of goods and passengers at all such as may hereafter be determined upon effected without any stoppage of the urse between the extremities of the ; and the extreme velocity of the ierefore, need not exceed twenty-five er hour, in order to perform the r in twelve minutes. The practica-f attaining this velocity is already by the experience of the London and gham stationary engine plane, where ient of eighty feet per mile, and with gines of only sixty-horse power each, elled at a speed of twenty miles per and, as the gradients on this railway e very considerably less, the speed as a matter of course, be proportion-creased.

OF IRISH PATENTS GRANTED IN DECEMBER 1837.

Chanter, of Earl-street, Blackfriars, and r Stamford-street, and John Gray, of Liver- improvements in furnaces and apparatus d therewith, for locomotive engines and purposes.

lWellman Wright, of Sloan Terrace, Engi-r certain improvements in machinery or s for bleaching and cleansing linen, cotton, r fibrous substances.

m Bridges Adams, of Porchester Terrace, er, for certain improvements in the con- of wheel carriages.

Blundell, of Blundell Hall, York, for an l method of operating on certain vegetable al substances, in the process of manufac-andles therefrom, and the application of products resulting from this method to other useful purposes.

Taylor Beale, of Church-lane, White-Engineer, for certain improvements and to his former invention, known by the ' a lamp, applicable to the burning of sub-ot hitherto usually burned in such vessels atus", and secured to him by former letters

NOTES AND NOTICES.

Manufacture of Silk.—It is a remarkable the first persons who brought wrought Europe were the Greeks of Alexander's h conquered the Persian empire, in which then included. In other words, about 250 years after Ezekiel, silk is known to have been use in the dress of the Persians. Jahn even conjectures that the famous robe which the Persians adopted from the Medes as a dress of honour, was of silk; and if so, as the luxury of the Medes was contemporary with that of the Babylonians, we should find silk on the frontiers of Babylonia, even about the time of Ezekiel. Now, what was known to the Persians, and possibly to the Medes, was not likely to be unknown to the still more luxurious Babylonians, who moreover had access to the shores of the country where silk might be found; and should it be alleged that the Persians had greater facilities of obtaining silk by the land route from the frontiers of China, the effect will be the same, for we may be sure that the results of Persian, as well as of Arabian and Phœnician commerce, found their way to the great mart of Babylon. As the Medes and Babylonians (or at least the latter) were luxurions and wealthy, and fond of rich dresses, it may well be supposed that they absorbed all the limited supply which reached them: and as the nations more west were less rich and of plainer manners, the merchants had no motive to carry the commodity to a more western market. This will show that silk may long have been in use in Babylonia before it was known in Europe and on the western shores of Asia. It is a remarkable circumstance that the silk came to the west manufactured in cloth half silk; and it is said the plan was devised of unravelling the stuff, which was rewoven into cloth of entire silk. The only proper silk manufactures that we can find to have existed in the west, were those of the Phœnicians at Tyre and Berytus; which seems to show that the Phœnicians not only possessed the trade in silk but the process of manufacture. which they carefully kept secret.—*Pictorial Bible.*

New Reaping Machine.—We have to congratulate our agricultural readers upon the invention of a new reaping machine, likely from its simplicity and and efficacy to form an important era in the rural labours of the farm. This machine is totally different from those highly ingenious implements invented by Mr. Bell, and Mr. Smith of Deanston; and, in operation, may be said to combine the clipping with the cutting principle. The cutters are attached to a revolving cylindrical drum, from which they are exerted on the inner side, together with the rake for carrying round the cut corn, from whence they move round towards the exterior of the standing corn; when, after having performed the work allotted to them in each revolution, they are again withdrawn to the inside of the cylinder, for the purpose of facilitating the laying down of the grain in a regular manner, and in being sharpened by a streak appended for that purpose. It also possesses the advantage never hitherto obtained, of being equally applicable to standing as well as lying corn, and can be worked on the most irregular surface in consequence of a regulating wheel preceding the cutter. It is calculated to cut ten acres a-day, with the assistance of a man and horse. This machine is invented by Mr. Robert Baldwin, Annan, Dumfriesshire. It has been examined in course of the last few days in the Agricultural Museum of Messrs. P. Lawson and Son, by Sir Charles Gordon, Secretary to the Highland and Agricultural Society of Scotland; D. Lowe, Esq., Professor of Agriculture in the University; J. D. Forbes, Esq., Professor of Natural Philosophy, University; J. S. Russell, Esq., M.A.; James Slight, Esq., curator of the Highland and Agricultural Society's Models; and several other gentlemen versant in mechanics and agriculture, who all concurred in expressing their high opinion of the simplicity of this invention.—*Correspondent of the Scotsman.*

Fire-proof Zinc.—The rapid strides made in the application of zinc, within these few years, to the purposes of the fine and useful arts, must have been generally remarked. The consumption of the article will be increased beyond all calculation if an invention which has just been announced prove to be well founded. The great objection to the use of

t he article in many situations is its fusibility and inflammability, but it is affirmed that a Polish gentleman who carries on the manufacture to a great extent in the vicinity of London, Baron Steinkeller, has discovered a process by which zinc is deprived of these obnoxious qualities, to as great a degree as cast-iron.

New Gallery of Science.—Such of our readers as frequent Regent Street must have observed a large pile of building growing up, of late, on the west side, soon after passing Oxford-street, and communicating with one of the houses in Cavendish Square. This, we are informed, is about to be opened as an *Institution for the Advancement of the Arts and Practical Sciences*, especially in connection with Agriculture, Manufactures, and other branches of industry; combining, in its results,—say the projectors,—many of the advantages of the *Ecole Centrale des Arts et Manufactures*, of Paris. The house in Cavendish Square will contain a Reading Room, Library, and accommodation for the meeting of persons feeling an interest in promoting the objects of the Institution, or desirous of acquiring knowledge of such new discoveries as may, from time to time, be made public. To it will be attached the Gallery, now building, which is to be 127 feet long by 40 wide, and well adapted, we are informed, for the exhibition of novel and useful Models and Apparatus illustrative of various branches of Science, and their application to the Arts; with a Laboratory, Experiment Rooms, a Theatre for Lectures, Consultation Rooms, for the use of inventors, patentees, persons wishing to make experiments, and persons seeking information on any point of science.—*Athenæum.*

Potato Brandy.—M. Krauss, of Dusseldorf, has lately given his attention to the deleterious effects of the spirit extracted from potatoes, and which is in general use in the north of Europe, both as a liquor among the lower classes, and as the basis of a finer class of cordials, and some medicines. Several physicians have already pointed out its deleterious effects; but as the researches of chemists could not find any injurious principle in the rectified spirit, no attention was paid to this opinion. M. Krauss imagines that he has found out the difference between spirit of wine and spirit of potatoes, but he deems it much more important first to show the extraneous matters introduced into the latter, and to this he at present confines himself: he says, that not only is the rectification of the spirit but too often carelessly conducted, but the spirit itself is made from potatoes which are either rotten, or which have begun to germinate. Its effects upon the human frame he describes as most dreadful; producing delirium tremens, idiocy, &c.; and as, from its cheapness, it is immoderately used, most of the crimes committed in Sweden and Rhenish Prussia are due to the nature and abuse of this brandy.

Falling Stones.—An account has been received from Brazil of the appearance of a meteor of extraordinary brightness, and as large as the balloons used by aeronauts. It was seen for more than sixty leagues in the province of Ceara, and over the village of Macao, at the entrance of the Rio Assu; it burst with a noise like thunder, and an immense quantity of stones fell from it, in a line extending more than ten leagues. The largest portion fell at the entrance of the river, and in various places they pierced through several dwellings, and buried themselves several feet deep in the sand. No life was lost, but many oxen were killed, an[d] severely hurt. The weight of those taken o[ut] sand varied from one to eighty pounds.—[C] *Herald.*

Saturn's Three Rings.—The *Leipzic* [...] announces, that the new number of Schun[...] Astronomical Notes, contains a discovery [...] Dr. Encke, that the planet Saturn, has *thre[e]* instead of two, as hitherto believed.

Marr's Fire-proof Chests.—The only iro[n] which protected the inclosed papers and doc[...] at the burning of the Royal Exchange, w[...] made on a new plan invented and patent[...] Mr. Marr. It is stated in the newspapers [...] been taken red hot from the ruins after bein[g] midst of the fire for twelve hours, all the doc[...] therein being in a perfect state of preservati[on].

The London and Greenwich Railway.—T[he] part of this line that now remains to be com[...] is that between Deptford and Greenwich; a[...] the works have been for some time past pro[...] with considerable vigour, although at presen[t] rupted by the state of the weather. The [...] where it crosses High-street, Deptford, ha[...] widened about six or seven feet, and brough[t] nothing at the distance of about 150 feet fr[om] street each way,—an arrangement which will [...] afford more room at the Deptford station, [...] render the turn which takes place at this po[...] acute. The walls of the arch, which are [...] brick and dressed with stone, are raised as [...] the springing on each side, and the cast-iro[n] intended to support the arch are already [...] ground. The arches forming the viaduct [...] this point and the river Ravensbourne (or D[...] Creek) are nearly all completed. No prog[...] been made beyond the Creek, except the [...] the piers for seven arches, nor are there any [...] ances of breaking ground.

Melting Snow with Salt.—At the close [...] lecture on electricity, on Friday evening, [...] Royal Institution, by Mr. Farady, he said he [...] to mention a piece of very foolish chymica[...] sophy which was too much practised at the [...] severe season. "People (said Mr. Faraday[)] the habit of sprinkling salt upon snow befo[re] doors. They could not do a more silly or i[...] thing. The rusult is to change dry snow [...] the temperature of 32 to brine at 0. The i[...] effect of damp upon the feet at this e[...] degree of cold is likely to be extreme. [...] (continued the lecturer), any one does sprin[...] upon snow in the street, he ought to feel it [...] of conscience to sweep it away immediately[...]

It used to be said of any extraordinary qu[...] that it was a "race-horse speed." Times a[...] ed; the favourite phrase on the turf at the [...] day, when a racer outdoes all his former o[...] is, that he goes "*at a rail-road pace.*"—[...] *Times.*

Common Road Locomotion—A corres[...] (N. O.) requests us to inform "L. M. B., [...] number 747, enquires about steam locom[...] common roads, that, if he will give his add[...] the information he can desire, will be sent [...] Any letter from N. O. left with our publish[...] be forwarded to L.M.B. But if N. O. ha[...] jection he would confer a favour on our re[...] general, if he would supply us with the info[...] he is possessed of for publication in our col[...]

LONDON: Printed and Published for the Proprietor, by William Angus Robertson, at the [...] Magazine Office, No. 6, Peterborough-court, between 135 and 136, Fleet-street.—Sold [...] Galignani, Rue Vivienne, Paris.

Mechanics' Magazine,

MUSEUM, REGISTER, JOURNAL, AND GAZETTE

No. 755.] SATURDAY, JANUARY 27, 1838. [Price 3*d*.

BERNHARDT'S WARMING AND VENTILATING PLAN.

Fig. 1

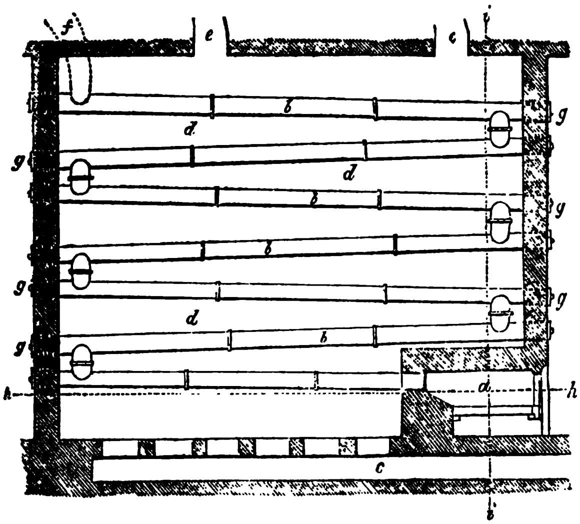
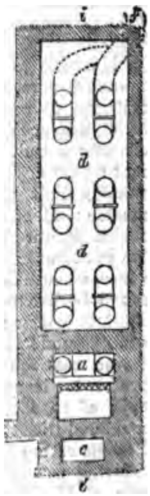


Fig. 2



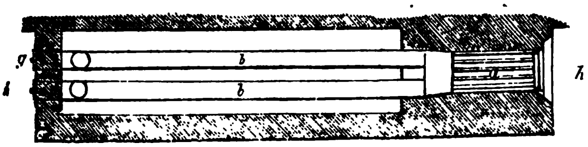
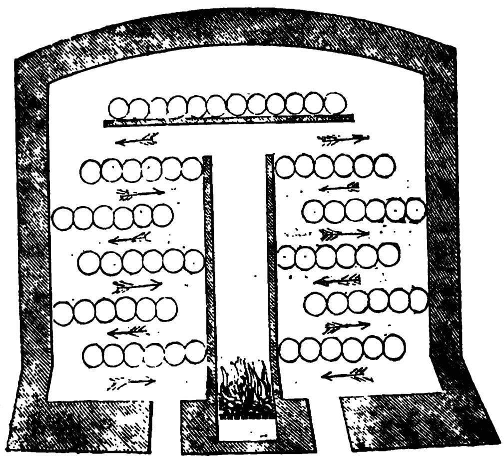


Fig. 3.

DR. URE'S HOT AIR STOVE.



(Fig. 4.)

REPORT MADE TO CHARLES BOYD, ESQ., COLLECTOR OF HER MAJESTY'S CUSTOMS, FOR THE INFORMATION OF THE HONOURABLE BOARD OF COMMISSIONERS, UPON BERNHARDT'S STOVE-FURNACES. BY ANDREW URE, M.D.F.R.S., &c. COMMUNICATED BY THE AUTHOR.

(From the Architectural Magaizne for January.)

My dear Sir,—Soon after the receipt of your note, enclosing M. Bernhardt's letter to the Hon. Commissioners of Customs, relative to warming and ventilating your Long Room, I paid a visit to Lord King's house, in St. James's Square, agreeable to M. Bernhardt's invitation to inspect his plan, as erected in it. I was accompanied by an intelligent scientific friend. What was my astonishment to find no less than four large elaborate furnaces built up in that moderate-sized mansion; all of them in full activity, and consuming four times as much fuel as would, with judicious economy, have been sufficient to heat a house of four times the size. The cost to Lord King of the said furnaces, and slate-flue contsructions, of M. Bernhardt cannot, I understand, be less than 1000*l.*; a sum at least four times as much as would have been adequate to the purpose in the hands of an intelligent English engineer, acquainted with the modes of heating adopted in the cotton factories.

Having caused an exact drawing to be made of M. Bernhardt's furnaces, I now forward it to you,* and request you will give it a most deliberate consideration. You will perceive a fireplace (fig. 1. *a*) similar to one of those under the cockle in the cellars of the Custom House. The flame from the grate passes directly into the first flue, above *c*; which, like the other flues, is a sheet-iron pipe, 8 in. or 9 in. in diameter, and 18 ft. in length. In this single stove there are at least fourteen (I rather think 16) pipes of that size, laid zig-zag, with a slight slope to the horizon, arranged over each other in twin rows (figs. 2, 3.), through which the burned air and smoke circulate backwards and forwards before they are discharged into the chimney at *f*. It is obvious that the lower pairs of pipes must partake of the ignition in the fireplace. Accordingly, upon the first two occasions, when I visited the said mansion, I found the lower pipes excessively hot; and suggested to Mr. Cubitt's clerk of the works to try their temperature, by introducing into them pieces of common solder. He did so; and he afterwards produced specimens to me, which proved that the solder was not only melted, but oxidized, by the pipes. The air of the space *d d*, in which the above twin rows of pipes are enclosed, must, therefore, be rendered unpleasant and insalubrious, by coming in contact with the lower part of the range, in a degree far worse than it is by sweeping over the pyramids of your existing stoves at the Custom House. Did you adopt M. Bernhardt's furnace, you might justly inscribe over it, *Incidit in Scyllam cupiens vitare Charybdin:* in plain English, you would get out of the frying-pan into the fire. There is, moreover, not the slightest novelty in M. Bernhardt's arrangement; zig-zag pipes, laid at various slopes, having been commonly used in England, France, Germany, &c., for upwards of a century past; and, indeed, the very scheme of enclosing them in a hot-air chamber is represented in books upon stove-heating, in my possession.

With regard to the practical influence upon the feelings and the health, of M. Bernhardt's stoves, as mounted for Lord King, I cannot speak in favourable terms. The gentleman who accompanied me at the first visit, though in vigorous health, was not long in the house before he felt extremely uncomfortable; and, at the end of less than an hour, he was obliged to leave it, in consequence of a violent headach, of which he did not get rid till he had breathed the external air for some time. My own sensations were exactly similar to those I experienced when standing near the outlet-valve of hot air in your Examiner's rooms: and, indeed, the cause was quite analogous; for the air issuing from M. Bernhardt's flue orifices indicated by my trials a temperature of 150° Fahr.: and it must have been at times higher; for the clerk of the works told me it frequently broke his thermometers, which had a range up to that pitch.

M. Bernhardt has since sought to account for these *torrifying* results by saying that the fires in his stoves were then forced, in order to dry the plaster-work of the house. I grant that this may be so far true; for, undoubtedly, Lord King's family could not have endured that offensive burnt air even half a day. Still, it is evident from these experimental facts, as well as from the construction of the furnace itself, that the least over-firing, from negligence of the servants, must communicate ignition to the sheet-iron pipe immediately connected with it; and that this pipe, so overheated, will taint all the air which passes over it. Upon Sylvester's cockle plan, as erected at the Custom House, the temperature of the ho

Description of Engravings.—Figs 1. 2, and 3 (see front page). Fig. 1, is a ground plan, showing the furnace and the two lowest sheet-iron pipes. Fig. 2 is a longitudinal section on the line *h h*. Fig. 3 is a cross section on the line *i i*. *a*, Furnace. *b*, Sheet-iron pipes. *c*, Cold air flue. *d*, Space for hot air surrounding the pipes. *e*, Flues to convey warm air to various apartments. *f*, Smoke flue. *g*, Small doors to clean out the pipes.

on pyramid, against which the cold pinges, is much more susceptible of tion than the lower pipes of M, Bern- s scheme. Indeed, I consider Sylves- lan, as originally constructed by Wil- trutt, Esq., of Derby, to be the least onable of all known arid-air furnaces. his magnificent factories at Belper, trutt sought to invert the natural or- ventilation, making the influx of warm air near the ceiling of the rooms, he efflux of used air to be near ottom. This arrangement, which is fifty years old in this country, has just imported as a novelty by M. ardt. He has, in like manner, im- the ancient plan of a subterranean t for supplying cold air to the bottom es, which has been familiarly known ry man of science for a century at which was the foundation of Mr. 's plan of ventilation, and is figured first plate of Gren's *Elements of stry*, published at London in 1800.

h regard to the downward circulation every sound physiologist will depre- as a noxious fallacy. The mephitic tions from our lungs, having a tem- re of 98°, rise and occupy the upper the room; and, if forced downwards means, must inevitably be breathed and again by its inmates before their es can be discharged at the level of gs or feet, in violation of the laws of gravity. Where parsimony of fuel sole object and boast of an empiric, trograde circulation may be rendered as, and certainly better than the aerial tion in German or Russian apart- ; but where health and comfort are y considerations, we should so regu- e circulation as that none of the air d by our lungs should enter them This point can be secured only ring rarefied exhalations to follow their l upward direction; recollecting, more- hat moist air is lighter than dry air of me temperature.

nay be admitted, as a general prin- that the comfort of sedentary indivi- occupying large apartments during the months, cannot be adequately secured mere influx of hot air from separate rooms: it requires the general in- of radiating surfaces in the apart- themselves, such as of open fires, of or other vessels filled with hot water or The clothing of our bodies, exposed h radiation in a pure, fresh, somewhat ad bracing air, absorbs a much more le warmth than it could acquire by merely immersed in an atmosphere even to 62° Fahr., like that of the Long Room. In the former predicament, the lungs are supplied with a relatively dense air, say at 52° Fahr.; while the external surface of the body or the clothing is maintained at, perhaps, 70° or 75°. This distinctive circumstance has not, I believe, been hitherto duly considered by the stove doctors, each intent on puffing his own pecuniary interest; but it is obviously one of great importance, and which the English people would do well to keep in view; because it is owing to our domestic apartments being heated by open fires, and our factories by steam pipes, that the health of our population, and the expectation of life among all orders in this country, is so much better than in France and Germany, where hot-air stoves, neither agreeable nor inoffensive, and in endless variety of form, are generally employed.

Reverting more particularly by M. Bernhardt's furnaces at Lord King's, we find in one of them 16 pipes, 9 in. in diameter, or 28 in. in circumference, and 18 ft. long; presenting, therefore, the enormous surface of 472 square feet. We must bear in mind that these are the dimensions of only one of the four stove furnaces in his Lordship's house. Taking all together, there is enough of iron surface, were it judiciously employed, to warm the vast area of St. Paul's or Westminster Abbey.

When I last visited these constructions of the architect from Saxony, as M. Bernhardt styles himself in his letter to the Hon. Commissioners, his noble employer, who was then in occupation with his family, very politely showed me the whole arrangement of the stoves, but told me he meant to employ them chiefly in seasoning the house during his absence in the country; and I found, in fact, that none of the stoves were heated upon that occasion.

The smoke, in circulating through the zig-zag pipes, deposits nearly the whole of its soot; so that, when coal is burnt in the fireplaces, the manufacture of soot in the apparatus must be prodigious, and the necessity of removing it of frequent recurrence. To have such a vast magazine of soot in the heart of a noble mansion can be neither comfortable nor safe. As the sheet-iron pipes readily crack and corrode, the stench, of the soot will be apt to transpire; or it may get inflamed, in which case it might set the house on fire. One of the smoke mains (pipes) crossing the ceiling of the passage in the under-ground story in a very awkward manner, passing into a soot-chamber closed with a hinged iron door of portentous aspect.

In conclusion, I take leave to state to you my firm conviction that the only method of warming your Long Room and subsidiar

apartments, combining salubrity, safety, and economy, with convenience in erection and durable comfort in use, is by a series of steam pipes laid along the floor [illegible] of the desk partitions, in [illegible], with small arched junction-pipes [illegible] the several doorways, to keep [illegible] clear, and at the same time [illegible] expansion and contraction [illegible], thereby providing [illegible] ness of the joints.

Should the Hon. Board [illegible] me with superintending [illegible] system of heating the Long [illegible] engage to place it in [illegible] practical engineer, who will [illegible] manner, and upon the [illegible] terms: I shall, however, [illegible] responsible for its answering [illegible] purposes above in [illegible].

I do not think [illegible] of open fire-grates will [illegible] the Long Room during [illegible], when the air from the [illegible] Thames is so extremely [illegible] unwholesome. This [illegible] be extremely wasteful [illegible].

From his second [illegible], which you have just [illegible] it would appear that [illegible] permitted to operate upon [illegible] rooms of the House of [illegible] had an opportunity during [illegible] which he lately [illegible] ing myself that he is [illegible] quainted with either [illegible] cal principles of [illegible] apartments, I have [illegible] while to inspect his [illegible]. If stupor, headach, and [illegible] occasioned by the air-oven [illegible] house, they cannot fail to be [illegible] aggravated form by the [illegible] of M. Bernhardt. Should [illegible] our legislature suffer their health and comfort to be compromised by such [illegible], we may expect to see as rapid [illegible] of elections as any partisan of [illegible] parliaments could desire: for [illegible] subterraneous furnaces, like those at [illegible] King's mansion, be set in action under the Houses of Parliament, a blow may be inflicted upon the heads of the nation, which shall throw the machinations of Guy Fawkes into shade.

To those unversed in the mysteries of jobbing, the employment of M. Bernhardt upon the committee-rooms, to the exclusion of many more capable native engineers, must *excite surprise. But, alas!* daily experience *shows how easily any* imposture may gull the *English public for* a season, however false *the* [illegible] *foolish* the scheme, provided *a* [illegible] *machine* can be got up, which, like a monster polypus, projects its *tentacula, feelers*, and *suckers* upon every object with reckless avidity. Such an association [illegible] scruples to use bribes, flattery, or [illegible] to compass its mercenary ends. [illegible], the prime functionary of this German [illegible] Society had the hardihood to tell me, in my own house, that, if I made an unfavourable report concerning it to the Board [illegible], he would employ Mr. Faraday [illegible] me, and write a certificate in its favour. In the same modest strain, he [illegible], that Bernhardt's plan of ventilation was founded upon principles which no philosophers in this county did (or could understand). As one of the humblest but not least zealous disciples of science, I acknowledge myself incapable of discovering either the novelty or worth of the scheme.

I am, my dear Sir,

Your's most faithfully,

ANDREW URE.

13, Charlotte-street, Bedford-square,
Nov. 23, 1837.

The old and well known plan of heating buildings by means of several ranges of nearly horizontal pipes, placed in a brick oven, and subjected upon one of their surfaces to the aerial products of combustion, and upon the other to atmospheric air, is fully described, with illustrative engravings, in the *Dictionnaire Technologique*, under the article "Chaleur," published in the year 1823.

"The *calorifères* of great establishments," says M. Payen, the author of the article, "consisting, usually, of cylindrical cast-iron pipes, built up in a brick furnace, are placed in a cellar (*cave*) under the premises. This distribution is convenient, as we do not embarrass the upper floor; but we suffer a loss of the heat communicated to the massive walls round the furnaces. In order to diminish this loss as much as possible, we ought to erect the *calorifère* in some underground suite of apartments, which require warming, leaving only the mouth of the furnace on the outside of the house, for the convenience of firing.

"Plate xii. (*fig.* 1.), *Arts Chimiques*, represents one of these *calorifères* cut by a plane perpendicular to all the axes of the cylinders. We see that the products of combustion developed in the fireplace pass under the first range of cylinders, rise between the first and second range, then between the second and third, next between the third and fourth, and so on till they escape above the uppermost range, under the brick arch, to reach the chimney. This vertical chimney, composed of copper pipes, gives off heat to all the apartments which it traverses in its way to the roof of the building.

g. 2. is the same *calorifères*, cut by a
1 the axis of the four ranges of pipes,
ows the direction of the currents of
in the interior of these cylinders.
mostpheric air enters by the lowest
it is conducted by recesses left in
ckwork from one row of pipes to
; it thus circulates in the zig-zag
ns indicated by the arrows, till it
he copper pipes which conduct the
ir to the upper floors. The air rises,
ly, by virtue of its relative lightness,
us occasions a current which con-
s long as there is heat in the fire.
e *calorifère* just described affords a
upply of heat, if the fire be active
current of air rapid; but, to deprive
ducts of combustion more completely
eat, which they are apt to carry off
e, we may render the warming of the
e methodical, by introducing the ex-
tmosphere round the warm pipes at
, near to their entrance into the
y, and lead it successively downwards
the horizontal pipes, in the inverse
n of the current of burned air; just
he double still-worms, we make the
water circulate upwards, while the
sing vapours circulate downwards. By
thod, the atmospherical air, during
le progress, strips the pipes of their
th the utmost possible energy; since
nes progressively hotter, and is always
at every point of its course, than the
s of the pipes with which it comes in
; and since the transmission of the
rough the metal is proportional to the
ce of the temperature of the inside
tside. If, on the contrary, the inter-
l external currents proceeded in the
irection, the temperature would differ
htly in many places; or, it might be
tter outside than inside; and, con-
tly, the transmission of the heat would
ly null in those places, or it might
imes, even opposite to what we wish
in."

Payen then proceeds to describe the
ction of a stove free from the vices
he has just pointed out, one which
s capable of employing, as usefully as
e, the heat disengaged by the fuel.
he details of this stove I shall not
as its sole object is economy, without
ce to the temperature of the pipes by
the atmospheric air is to be heated.
he experience of the gentlemen in the
Room of the Custom House, and in
counting-houses in the city, where
oves have lately been erected, it ap-
*certain that air exposed to metallic
y heated beyond a certain pitch, ac-
most insalubrious* properties, and becomes capable of inducing an apoplectic condition of the brain in persons plunged into and breathing it.

In my former paper, published in this Magazine for April last, (and *Mech. Mag.* vol. 27. p. 12.), I have endeavoured to explain the rationale of the injurious action of such air upon the living system. Every pathologist will tell us that changes in the condition of the atmosphere, although inappreciable by chemical and physical tests, are frequent causes of the most formidable and fatal maladies; witness the malaria of the Campagna of Rome, of many places in the West Indies peculiarly subject to yellow fever, of cholera, influenza, typus fever, and scarlet fever, &c. Not only such alarming epidemics, the *nova cohors febrium*, but many obscure chronic derangements of health, are produced by apparently slight changes in the constitution of the air of our apartments. Three years ago, I erected, in a spacious bed-room of my own house, a stove, which was never heated so high as the boiling point of water, but which allowed no circulation of air by the chimney, except the small quantity which was admitted very near the hearth-stone, for supporting a slow combustion in the fuel. Every thing seemed comfortably and philosophically arranged. The temperature of my room was nearly the same night and day; being, upon an average, from 55° to 60° Fahr. In a short time, however, my natural vigour of body and mind began to give way; my sleep became disturbed; my appetite declined; a furious cough, with pains in the chest, supervened, without having been preceded, however, by any of the usual symptoms of catarrh; and my bowels were obstinately constipated. For this general distemperature, which continued for several months, my kind medical friends prescribed a vast variety of remedies; such as blood-letting, blistering, cupping, expectorants, antispasmodics, emetics, diaphoretics, mercurial alteratives, &c.; a pharmaceutical ordeal which I underwent without any material benefit. At length, I discovered that the main cause of these disordered functions was a peculiar state of the blood, caused by breathing an atmosphere not sufficiently renewed, in consequence of a nearly air-tight stove apparatus. I now caused the stove to be removed, fire to be rekindled in the open grate; took a strong dose of purgative medicine, to restore the hepatic secretions; and, within three days of this change of plan, I felt myself a new being; the powers of my body and mind resumed their wonted alacrity; in which state, thank God, they have ever since remained, owing, chiefly, I have no doubt, to unembarrassed ventilation in every part of my house, and the suppres-

sion of stove-malaria. To render such arid stoves as little as possible insalubrious, we should remove to the greatest distance from the fire the row of pipes upon which the aerial products of combustion first impinge; protecting them, also, from the direct contact of the burned air by a bed of fire-tiles, upon the same principle as the gas retorts are now generally mounted. We should also imitate the modern mode of arranging the fire-flues in the gas-works, so as to make the burned air first act upon the top range of retorts in each furnace; thence circulate obliquely downwards, and be discharged into the chimney, below the level of the bottom of the lowest range. By this method, an economy of from two thirds to three fourths of the fuel has been obtained over the former plan of letting the products of combustion escape at the top of the furnace, above the uppermost retort. *Fig.* 4 is a cross section of such a stove. I shall furnish a detailed description of it, for the next number of your Journal.

In the Number of this Magazine for September, 1835 (vol. ii, p. 407), there is a well-written paper, by Censor, upon the comparative advantages and disadvantages of the various modifications of the hot-water system of warming apartments. With his judicious statements and reasonings my views entirely coincide. It is a remarkable fact, that the inventor of that system, M. Bonnemain, whose acquaintance I had the pleasure of making, upwards of twenty years ago, in Paris, had erected it near that capital prior to the French revolution, and in, probably, a more complete form than it has been ever since, either in his own country or in this. His water-stove is described, under the article "Chaleur," in the *Dictionnaire Technologique*, published in 1823, quoted from above; and is not only economical in fuel in the highest degree, but is provided with an ingenious mechanism of expanding bars, on the principle of Harrison's gridiron pendulum, for regulating the admission of air under the grate, and thereby the vivacity of the combustion. The best test of the excellence of his arrangements was, the success of his *poussinières*, or nurseries, warmed by hot-water circulation, for hatching eggs and rearing chickens, in such numbers as to supply, in a considerable measure, the Parisian market. This ingenious and profitable establishment, in which he had embarked his little fortune, fell a sacrifice to those disastrous times, When I knew him, he was occupied in giving private instructions relative to the construction of hot-water stoves, and *artificial incubation*. He was then a stout hale man, about seventy-two years of age, of the most amiable complacency of manners, and well acquainted with all the interesting inventions of the day. Many an instructing prominade I had with him He was ever ready to conduct the curious stranger to see whatever was most novel in science and art, terminating his round of visits at the Jardin des Plantes, in the vicinity of which he had his humble abode. Every body esteemed him, and sympathised with his misfortune. At a subsequent period, a petition was presented to the French government signed by many distinguished savans, soliciting a small pension for the venerable *octogenaire;* but with what success I have not heard.

The article "Incubation artificielle," in the *Dictionnaire Technologique*, was drawn up under his directions, and is not only valuable from its details, but as a document in the history of *calorific* invention.

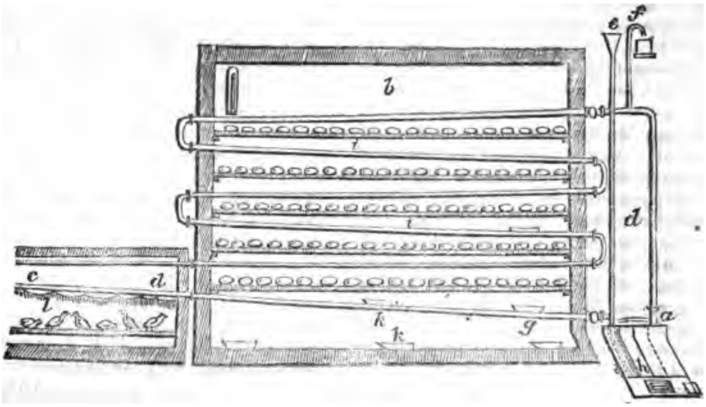


Fig. 5.

The water-boiler is shown at h, (fig. 5) with the expansion rod, which regulates the air-door of the ash-pit: a is a stopcock for modifying the opening by which the hotter particles of water ascend; d is the water-pipe of communication, having the heating-pipe of distribution (b) attached to it; which thence passes backwards and forwards at i and k, with a very slight slope from the horizontal direction, through the *poussinière*. It traverses this apartment, and returns by g to the orifice of the boiler, where it turns vertically downwards, and descends to nearly the bottom of the boiler at h, discharging at that point the cooler, and therefore denser particles of water; which displace, by gravity, those which, at a, are continually pressed upwards; $e\,h$ is a tube surmounted with a funnel, for keeping the range of pipes always full of water; and f is a siphon orifice for the escape of the disengaged air, which would otherwise be apt to occupy the tubes partially, and thus obstruct the locomotion of the aqueous particles.

The faster the water gets cooled in the serpentine tubes, the quicker its circulation will be; because the difference of density between the water in the ascending and descending legs of the system (viewed as two vertical columns) which is the sole cause of its movement, will be greater. $k\,g$ represent small saucers filled with water, which supply the requisite moisture to the heated air, so as to place the eggs (arranged in a series of trays) in a humid atmosphere, similar to that under the body of the hen.

When we wish to hatch eggs with this apparatus, the fire is to be kindled in the boiler; and, as soon as the temperature has risen to about 100° Fahr., the eggs are introduced, but only one-twentieth of the total number intended, upon the first day; next day, a like number is laid upon the trays; and thus in succession for twenty days; so that upon the twenty-first day the the greater part of the eggs first placed may be hatched, and that we may obtain daily afterwards an equal number of chicks. Regularity of care is thus established in rearing these tender animals.

During the first days of incubation, natural as well as artificial, a small portion of the water contained in the eggs evaporates through the shell, and is replaced by a like quantity of air, which is afterwards useful for the respiration of the animal. If the warm atmosphere surrounding the eggs were very dry, such a portion of their aqueous matter would exhale through the pores of the shells as would endanger the future life of the chick *in ovo*. The transpiration from the body of the hen, as she broods over the eggs, generally counteracts this desiccation; but, notwithstanding, in very dry weather, many hatching eggs fail from that cause; unless they be placed in moist decomposing straw. The water-saucers ($k\,g$) are therefore essential to success in artificial incubation.

Any one who considers the preceding description will be satisfied that M. Bonnemain, upwards of fifty years ago, had erected the hot-water system of warming apartments, in the most philosophical, judicious, and economical manner. The Marquis de Chabannes seems to have done nothing but pirate his plans, and disfigure them so as to make them pass for his own.

Whatever mode of heating be adopted, with a view to economy, in lofty public buildings, where there is abundance of air, we should never suffer our domestic apartments to be warmed by a stove, to the suppression of our open fires; which, when well constructed upon the Rumford plan of radiation, give the most comfortable quality of warmth, with complete change of atmosphere.

THEORY OF THE SPINNING TOP

Sir,—The following will, I think, be found a feasible solution of the phenomenon of the spinning top:—

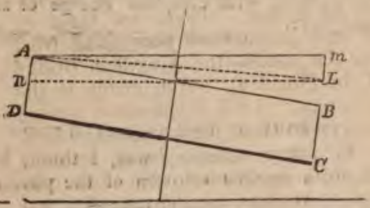
Suppose the top to have been perfectly balanced upon its point, and then secured from the action of the atmosphere, and other causes tending to disturb its equilibrium, it would under these circumstances stand for ever, and it is only because this operation is of so extremely delicate a nature, that it cannot be performed.

Let us, however, for the sake of illustration, suppose this to be accomplished, and suppose also a number of circles touching each other, described upon the surface of the top, then, *every part of every circle will be equidistant from the centre of the earth; and as* gravity acts or pulls equally at every point in every circle, the reason is seen why the top would continue to stand; when likewise, the top is spinning in this perfectly true position, the same law governs it, or is in action.

But when an inclination is given to the axis or spindle of the top, so as to divert it from the perpendicular, a question arises, why is it that the spindle

resumes its original position. Is not this the reason? When the inclination is given to the top, the atoms on one side of it are depressed and brought nearer the centre of the earth, whilst the atoms on the opposite side are elevated and thrown farther from it, a semi-revolution brings the elevated atoms to the lower side, and the lower atoms to the upper side; thus we see in operation a process directly opposed to the law of gravitation, which must distinctly be observed, is the cause of the standing, as well as falling of the top.

The atoms being thus impelled alternately to and from the centre of the earth, obey an impulse at variance with their inertia; because, when rising, they would continue to rise, and when falling continue to fall. Having established this fact, we will endeavour to explain the *modus operandi* by which the equilibrium is restored.



Let A B C D represent the top spinning in the inclined position, then the atoms at A will be at their greatest elevation, and have *a tendency to move in a plane with the horizon,* (and not in the direction A B,) they will, therefore, have a force towards *m*, and at the same time the action of the top draws them towards B; thus they are acted upon by two forces at the same time, and in different directions—one from A to *m* by their inertia or tangental force; the other as before described towards B; under these circumstances, they will therefore, take a path A L, and this path will indicate the diagonal of the parallelogram A*m* L*n* of the forces, and also show the point L to be the position B would attain when the top had regained its perpendicular position; of course a similar illustration applies to the lower part of the top, and would likewise discover the same results.

S. W. S.

Leamington, Jan. 19.

COL. MACERONI'S IMPROVED SPHERICAL SHELLS.

Sir,—In reference to my paper you published on bomb-shells, I beg to hand you a proposition concerning the use of common fuse spherical shells, for horizontal projection from the guns of a ship, as connected therewith.

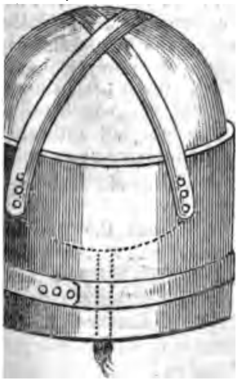
While on board the ship of the Captain Pacha, in the Black Sea, in 1828, I persuaded him to allow me to prepare 13-inch shells to project from his sixteen magnificent guns of 13-inch calibre, instead of the stone shot hitherto used. The method I adopted was as follows:—I procured bottoms or sabots of lime-wood, as shown in fig. 1, to be turned.

Fig. 1

This bottom is strengthened by an iron hoop it. A small hole ($\frac{1}{8}$-inch) is pierced through. After knocking off the rings from the shell, I placed a strip of woollen cloth or tow soaked in hot tallow and resin, around the inner surface of the sabot. I then placed the shell, fuse downwards, so as a bit of quick match (runner) passes through the little hole. I then caulk the small space between the shell and the cup with tow and hot cement. Two pieces of iron hoop are then passed over the shell, and nailed fast and tight to the sabot, and well wedged; or for small small shells, broad pieces of strong sail cloth, drawn down as tightly as possible, and then saturated with boiling hot cement of pitch and tallow, which causes it to shrink and tighten as water does rope, &c. The bit of runner just peeping from the hole below, is then covered up by nailing over it a bit of triangular canvass dipped in the cement. A bit of wire or tape is left under one angle of this cover, which being pulled up, tears,

ses the little hole and runner. nly done by the gunner at the of placing the shell within on. The shell complete, pre-earance shown at fig. 2, and placed in a tub of water, or

Fig. 2



exploding gunpowder without cted by either, as I exhibited ptain Pacha.

of lifting the shell by the piece of leather or wove cord oks or loops at the extremities, the ground or deck. The bottom is rolled on to it, and d very handily by two men, with the same sort of bar with see two draymen carry a barrel The shell being hung close to of the cannon, a gunner tears ver of the hole, or merely lifts ich is sufficient, and places it un, along the cylinder of which pushed with very little effort, care to grease the wood with

is is the way in which spheri-hells should be prepared, both ield and naval service. The lls for the field may have the attached to the bottom as they with the shot.

eeks I will send you a descrip-e sabots which I constructed rkish guns of the Dardanelles, *-five inches calibre!* These used to project balls of stone; iron to fit them, would weigh *and contain 120lbs. of powder*; *difference here between such and an inert ball of stone!* I had not the means of casting 25-inch shells, so I made two sabots to fit these guns,—one contained four 10-inch, and ten 4-inch shells. The other was formed of seven 8-inch shells, thus constituting what we may call *canisters of shells*. But I must give the diagrams, &c. along with the account.

Meanwhile, I am, Sir,
Your obedient servant,
F. Maceroni.

PROSPECTS OF LOCOMOTION ON COMMON ROADS.

Sir,—Your correspondent L. M. B., requests information upon the present state of steam locomotion upon common roads. I am intimately aware of every thing that has been done, or is now attempted to be achieved in that department of science. There are three or four new productions now being tried upon the roads (the Vauxhall Bridge and the Finchley), but in mercy to the "inventors," I will not mention names, having seen their performances, which, like so many others, bring common road steam locomotion into utter contempt. Another gentleman, who was connected with the Southampton Railway, has had the folly to put off his faith in railways, which have a real existence and splendid action, to realise a vision in some dream, wherein he imagines to have invented a boiler for locomotive purposes, far superior to any existing. His application of the portent is to be on the common roads; and so all his friends, and all those who witness or hear of his performances, will be confirmed in their prejudices against such an application of steam power, and join in the cry of, "Impossible!"

Mr. Gurney has found patrons, amongst whom is Sir George Cayley, who have supplied the funds for the construction of two new steam carriages, which have long been completed, and were to have been put upon the Brighton road. He knows, and I know full well, why they have not been started! The boilers are on the old stale *tubular*, impossible principle—that's enough!

Sir George Cayley now gives up terrestrial travelling, and has decided on navigating the air with steam balloons, pro-

pelled by "his friend Gurney's tubular boilers." I sincerely wish him success, but my ideas, and those of others, on *balloons*, are recorded in your valuable pages.* * * * * *

I have invented and constructed the models of two new boilers, far, far superior to that even which propelled my steam carriage 5,000 miles at the average of fifteen or eighteen miles the hour. I should be glad to show my new boilers to any one connected with railroad, or common road, locomotion, or steam navigation. There are at present none other such;—but I am now helpless, as was James Watt, until he found a Bolton.

Your obedient humble servant,
F. MACERONI.

Jan. 22, 1838.

NAUTILUS'S ASTRONOMICAL PHENOMENA.

Sir,—I believe I can with truth assert, that none of the contributors of your scientific and practical journal, have been more badgered than your humble servant O. N. has been:—1st, floored by Kinclaven, (this I acknowledge, and) 2d, satirized by the "fastidious Nautilus," and lastly reproved by Iver M'Iver. In justice to you Mr. Editor, however, I am bound to confess, that you have used me kindly, and thus circumstance has induced me to go on steadily in my course: but without further preface I beg leave to make a few remarks on the last curious letter of Nautilus in No. 751.

Well, Mr. Editor, I must positively assert, and that without any fear of contradiction from any of your able mathematical contributors, that Nautilus's knowledge in the geometry of spherical trigonometry is not of the first order, and this he has himself most satisfactorily demonstrated in his last letter as above numbered.

From the pompous manner in which Nautilus has headed his last article, any one must have imagined that he had discovered a well stored nest of golden eggs. But lo! on investigation it turns out that they are only common eggs and very stale ones too, having been all laid more than 3000 years ago. The truth is, the key to Nautilus's last discoveries is contained in the two following simple propositions; (?) namely, that one circle cannot cut another in more points than two; also if A is any arc of a circle, the sin. tan. sect. &c., of A is equal to the sin. tan. sect. of 180°—A; and these propotions are just as old as the eggs are,—but to be serious.

Let P represent the position of the North Pole, D and R the places of Procyon, and Capella, Z R D a vertical circle passing through both stars, draw the great circle P N perpendicular to Z R, then if the complement of the latitude be greater than P N (if equal to P N the problem will just be possible, if less impossible) two equal arches of great circles P Z, P Z′ can be drawn as represented in the diagram. Hence, in the two spherical triangles P R Z, P R Z′ we have P Z = P Z′, also P R and angle P R Z common to the two triangles P Z R, P Z′ R. Now, if these things are given, or what is the same thing, when two sides of a spherical triangle and an angle opposite to one of them are given to determine the rest, every one knowns that has paid sufficient attention to the subject, that this is one of the ambiguous cases in spherics. But it is manifest that the angle P Z′ R, is the supplement of the angle P Z R. In short if the azimuth angle P Z R is north, N degrees E, when procyon and capella are first in the same vertical circle, the azimuth angle P Z′ R, when they are again in a vertical circle will be south N degree east; and how the ambiguity is to be removed I have explained in my letter in No. 732; so, that instead of there being any phenomenon or novelty "in the stars capella and procyon being both in a vertical circle twice in the same night," &c., I must inform Nautilus, that it would be a more singular phenomenon if he could have proved the contrary. In one word—as sure as the first event takes place so sure will the second follow. So much for Nautilus's interesting Astronomical phenomenon.

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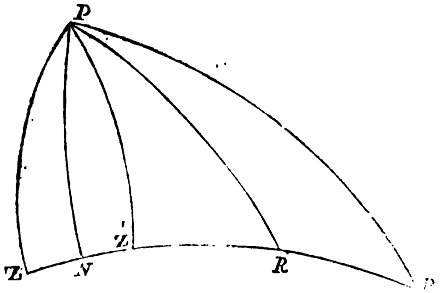
* The information which we desired with respect to locomotion on common roads, was in relation to what has taken place within the last year or two—since the withdrawal of Mr. Hancock's carriages from the City Road. We have therefore omitted a portion of Col. Maceroni's letter relating to performances recorded, and opinions which have been already published in our pages, as well as in those of other periodicals. ED. M. M.



ilus then goes on to assert, I have made another unfortunate en he says in answer to Iver s question of 'why the perpen- P N must fall upon D Z pro- ' that if it did not so, the zenith of procyon would be greater P,'' &c. Nautilus then informs the perpendicular P N must fall of the triangle P Z R, and that ith distance of procyon will be an 90°, &c. I must inform that he has here displayed the e want of practical knowledge as vinced in his theoretical vagaries; ng leave most positively to assert, zenith distance Z R of procyon

86°..27'..46''	sin.	9.999172
84..21..20	sin.	9.997889
83..20..30	sin.	9.997061

e, Z D = 83..20..30 × 12..12 95°..33'..29''; a rare position in- Ir. Nautilus, for an observation. procyon is below the horizon at time the two stars are in the ertical circle may be otherwise as follows:—

= 34°..2'..0 sec.		0.081596
I = 22..12..55 cot.		10.388910
I 71..18..6 tan.		10.470506

is, the azimuth angle P Z N is 1°..18..6 east, at the time the rs are first in the same vertical. ll now compute the rising ampli- procyon from which it will be at own whether procyon is above or he horizon.

Edin.	55..58..0 sect.	0.252064
procyon	*5..38..40 sin.*	*8.992796*
	79°..52'..27'' cos.	*9.244864*

procyon rises at Edin[r] on Feb. *N 79..52..27* E. But the when the perpendicular P N falls within the triangular P Z R, instead of being less than 90, is in reality no less than 95° 33' 29''; or procyon, will be 5°.. 33'..29'' under the horizon at the first period of their being both in the same vertical circle; and the following calculation deduced from Iver M'Iver's Astronomical rule will place the matter beyond dispute:—

Referring to my solution No. 743, page 70; also, to Iver M'Iver's rule, as demonstrated by me, No. 732, page 330, when the perpendicular P N falls within the triangle Z P R, then the angle Z P N 22°..12'..55'', N P R 49°..56'.·. 22'' .·. N P D = 86..27..46. Hence,

P Z	34...2...0	sin.	9.747936
Z P N	22..12..55	sin.	9.577592
Z N	12°..12'..59''	sin.	9.325528

azimuth angle P Z R, when the two stars are in the same vertical has been determined to be only 71°..18'..6'', which plainly indicates that procyon is then below the horizon. Hence, notwithstanding the confident way in which Nautilus has asserted, that he had mistaken the meaning of what Iver M'Iver stated, he will now find from the various blunders he has fallen into in his last letter, that it is he himself that has mistaken Iver's meaning; and I request that Iver M'Iver, well be kind enough to state whether I have mistaken his meaning, when he asked me to explain " why the perpendicular P N must fall upon R Z produced." If Nautilus possesses a grain of candour, he will admit his mistakes, and perhaps, he will find it necessary to make some corrections upon some other statements he has made in his last letter which I have not yet alluded to.

I am, your's, &c.

O. N.

CHAPLIN'S IMPROVED PROCESS OF TANNING.

Sir,—I take the liberty of forwarding you a copy of a circular I have received in common with most of the members of the tanning trade, setting forth the advantages which are stated to be incident upon the adoption of a new method of tanning, patented by Mr. Chaplin, of Bishops Stortford. You will, perhaps, think the subject sufficiently important to publish it in your valuable practical Magazine, in conjunction with some observations which I have made upon the statements therein.

"The inventor and patentee of the new kind of leather, having been engaged for nearly two years in perfecting the fabric and investigating its properties, wishes now to lay before the public, and particularly the various branches of the leather-trade, a short statement of its nature and advantages.

"The great peculiarity of the patent leather arises from the hide being kept extended during the process of tanning, so that its pores are held open while the tanning matter enters and perfectly combines with every part; and, at the same time, the leather is prevented from swelling out, or becoming thicker than the natural substance of the hide. It is this unnatural thickening, by the old process of tanning, that is the cause of sole leather afterwards *sinking under the hammer*,—a defect well known to practical men: and it is also the cause of serious evils, however little suspected, to the wearer. For the hide, being suffered to remain loose in the astringent liquor, becomes not only inflated, and thicker than it ought to be, but smaller also; it shrinks, or is drawn up together. The consequence is, that when it is afterwards exposed to the pressure of the foot, and bent and worn in various directions, its tendency is to expand and open, so as to regain its natural dimensions; and this occasions a perpetual opening of the pores, admits the wet, and soon renders the leather soft and flabby.

"In the patent leather all this is reversed. The hide being kept stretched while tanning, acquires no unnatural thickness, and no diminution of size; on the contrary, it is slightly enlarged. The pores are held open while the tan enters and fills them; and when, being completely tanned, it is released from the extension and pressure, its tendency is to recoil,—to shrink back to its *former size: so that* the pores, instead of *perpetually opening*, are constantly becoming *more firmly closed*,—binding the leather, *and rendering its* texture more compact and firm; and effectually resisting the entrance of wet.

"The difference between a fabric which, having been contracted to less than its natural size, is perpetually spreading and opening its pores; and one which having been kept extended during manufacture, is perpetually shrinking back and thus closing its pores, must be obvious to every one.

"For proof of these facts, the inventor of the patent leather invites investigation and trial. It will be found that the sinking of ordinary leather when hammered, is greater or less as it has been more or less thickened in tanning: and when, owing to the use of acids to quicken the process, or to any other circumstances, the thickening has been greater than usual, the sinking under the hammer will be great in proportion. It will also be found that the patent leather *does not* sink under the hammer, and cannot be hammered out or made larger; that the soles must be cut as large as they are intended to be when worked; and, by very accurate observation, an actual shrinking may be detected. The soles, when finished, will be found much harder and firmer than the leather from which they were cut; and the more the shoes are worn in wet weather, the firmer they will become, and the less pervious to water.

"For mill straps, and other leathern appendages to machinery, the value of leather that will not stretch, is well known; and it is expected that two psrsons using these, the patent leather will prove a most important acquisition."

To enable the reader to understand the preceding extract from the circular, it is necessary to state, that Mr. Chaplin's process consists in sewing two hides together into a bag (each hide forming a side), and filling the bag or sack so made, with the tanning liquor. The bag is then suspended, and as the liquor oozes through the pores of the skin, the hide is tanned. As there are often cuts and holes in the hides, these have to be provided against by being sewed, or plugged with pegs of wood, &c.

Most persons in connexion with the leather-trade will recollect, that some twelve or thirteen years ago, a Mr. Spilsbury obtained a patent for a method of tanning, effecting the same end as Mr. Chaplin's mode, though in a different way. They will perhaps also recollect how signal was the failure of the project, how great the fall from grandest expectations, to melancholy certainty. Mr. Spilsbury's plan was to disten

in frames, and to keep them
ded while the tanning liquor
l through them by mechanical
the hide being thus tanned in
tively short time,—in eight and
rs, if I recollect aright. It was,
Lafitte who entered into an
ent with Mr. Spilsbury for the
atent, spent an immense sum
in fitting up machinery for
on the business, and bought
skins in France in order to
monopoly. The reasons why
failed were these: — In the
hides being of various sizes,
a great loss in adjusting their
imensions to the size of the
nd, secondly, the leather re-
om this process was of lighter
an the common leather. As
always sold by weight, a
was sustained by the paten-
led to the abandonment of the
newhat similar objections ap-
r. Chaplin's method. With
the first, although Mr. Chap-
ly to find one hide which will
at similar in size and shape
, instead of having to fit a
various sizes to one-sized
ill there will be a loss, and I
nk that the loss in time oc-
ewing the bag, mending holes,
han equalled the loss in Mr.
method. The weight of the
uor in the hide-bag is a me-
essure forcing the tan through
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imilar to that which occurred
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ment Mr. Chaplin holds forth
keeping the hide distended—
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n of tanning to be a mere
illing of the pores with tan,
lin asserts in the following
as it is believed by many
e, and as it is described in
clopædias.

itriol, nor other acid, nor hot
y other chemical means, are
cilitate or quicken the com-
an with the skin. All these
have a tendency to injure and weaken the fibre, and they are frequently the cause of brittleness in the leather. The unusual means employed by the patentee are purely *mechanical*, and consist simply in the opening or extension of the hide."

Tanning is essentially a *chemical* process. The tannic acid of the liquor, chemically combines with the natural gelatine of the skin, and forms a tannate of gelatine, which is a hard substance, insoluble in water, and which gives to leather its peculiar properties. The very fact of tanning being a chemical process, appears to me to render a due modicum of time essential in all tanning methods. There must be sufficient time allowed for the chemical combination of the two substances to take place. Hence, the reason for using stimulants to quicken the combination, the use of which Mr. Chaplin deprecates. All certainly that have been hitherto tried, have, however, injured the quality of the leather; and a stimulant which will not have this objection yet remains to be discovered.

Mr. Chaplin further recommends the use of *terra japonica* in tanning sole leather after his method.

"The discovery of the new process has enabled the patentee to make use of *Terra Japonica* in tanning sole leather, by which a considerable saving is effected; so that he can offer his article at less than the usual price. For a considerable time he had persevered in endeavouring to make sole leather with it by the ordinary process, but had at length relinquished the attempt, and confined its use to the tanning of dressing leather; the sole leather having always proved of a very inferior description. But in connection with the new process the result is totally different, and he does not hesitate to state his opinion, that, when so applied, the Terra Japonica is superior to any other material now in use for tanning. The quantity of gum-resinous matter which it contains enables the leather to resist wet, at the same time rendering it tough and supple, and peculiarly free from any disposition to crack: but it appears, that, when applied in the old way, its effect is unfavourable to the perfect combination of the tan with the hide. Being of an extremely thick and glutinous nature, the liquor made from this substance does not so readily find its way into the smaller pores as liquor of a thinner consistency; and requires some such assistance as is afforded by the opening or extension of the hide in the patent process."

Is Mr. C. aware that a patent was ob-

tained previously to his, for the use of *terra japonica* in tanning, by Mr. Brewin, of Old Kent Road? Mr. C. has evidently himself been infringing, and inducing others to infringe a very valuable and excellent patent right. The use of *terra japonica* alone has, I believe, never been found to answer; it is only by a judicious mixture with oak-bark, and sometimes other things, that a good article, both for the market, and for wear, can be produced; this has been discovered by Mr. Brewin, and he has certainly a right to the monopoly of its use, otherwise I am mistaken in my idea of the patent law.

The numerous attempts which have been made to shorten the process of tanning will convince every one that it is a subject worthy of further investigation, not only in a pecuniary, but in a scientific point of view. I really think, however, that the attention of improvers is not sufficiently directed to the abridgment of the manual operations of the trade. Not a single patent (as far as I am aware) has been taken out to this end, and I believe in every one taken out great additional manual labour, and various machinery have been rendered necessary. Now, in extensive establishments, with a proper arrangement, time appears to me not to be so valuable as labour, either manual or mechanical. Suppose the quantity of hides in the pits to be so much floating capital—is 3 or 4 per cent. interest, equivalent to the labour necessary to abridge the time? I should recommend to the consideration of tanners, the abridgment of manual labour, and that without machinery.

I am, &c.

A TANNER.

Bermondsey, Jan. 20, 1838.

UNFAIR CONSUMPTION OF GAS WITHOUT METERS.

Sir,—One of the principal causes of the unprofitableness of the majority of the Metropolitan Gas Companies, arises from the unfair consumption of large quantities of gas by those who pay at a fixed rate per burner, instead of by the [illegible], as registered by a meter. This is particularly the case in butcher's shops, at coal and potatoe sheds, and the places where external lights are used. Because the payment is made at a stated sum for each light, this class of shopkeepers erroneously imagine that they have a right to burn as much as they can possibly draw from the gas main. Remonstrance from the servants of the companies has been found useless; and as no mode of checking the abuse has been resorted to which would render the consumption of more than a stated quantity, impossible, the evil instead of diminishing, is increasing to a great extent, so that the already small profits of the companies are likely to be brought to a minimum, if the balance does not even pass to the other side of the account.

Dealers in almost all other descriptions of marketable commodities purchase and vend by weight and measure, but the manufacturers of coal gas dispose of that article to one class of consumers for a fixed sum, without measure. In other words, these customers are permitted to burn from six to ten times more gas than they pay for. In St. George's, Newport, and Farringdon markets, Lambeth Walk, Whitechapel, and a score of other public places in town, burners for which only a rental of from 2*l*. to 4*l*. is paid, are by the contrivance, of at least three-fourths of their consumers, made to burn a volume of gas, equivalent to 16*l*! Indeed two-thirds of the shopkeepers dispense with the use of burners altogether. After nightfall, and until ten or eleven o'clock every evening, during six days in the week, columns of ignited gas, measuring in diameter from half an inch to two inches may be seen issuing from the *bare service pipes*, under a pressure of 15 or 20 tenths!

This ruinous system of burning gas is one of the results of the excessive competition that now prevails in the trade, an implacable and destructive rivalry, which is unhappily cherished by six out of eight of the metropolitan companies to the great loss of the shareholders.

That each of the establishments may secure an adequate rental, agents or canvassers are employed, and it is the interest of these persons to obtain as

onsumers as possible, as a cer-olument for each depends upon ccess. Hence, every encourage-held out to induce parties to consumers; the only condition ed for, is, that a certain sum, r 4*l.*, be paid annually, for which l sum, (it is tacitly agreed) that sumer be allowed to burn as s as he pleases in any number of In this case there is no restraint, k whatever enforced by the con-the consumer considers that by the limited sum stated in his , he is licensed to consume a of gas equivalent to ten times ; this flame which proceeds from ner or tube may be a reason-, or it may resemble the "torch ed the Ephesian Dome;" whe-neasures five or fifteen inches in natters not to the canvasser—he, standing, receives his commis-on the number of burners named ontract.

y the liability of gas companies mischievous abuse of property, o indicate the necessity for a use of the gas meter, as this ent records with the greatest pre-e exact quantity burned; and as truction of it is such, as to pre-y attempts at imposition either art of the manufacturer or con-In fact the meter is an impar enser of justice to both parties: annot fail to excite astonishment, withstanding this valuable pro-here is not one instance in a . where its services are made use

illuminating gas was sold at nearly the price now charged, it was n considered a more economical an that produced by either oil or But the profits have not in-with the consumption; on the , they have diminished in the io that the demand has increased. cine in the profits commenced, ne original companies could pos-mburse themselves for the great f capital that was necessarily ex-n bringing into use an infant ma-e; and the chance of their doing s rendered less probable, from umstance, of new companies the field under all the advan-uperior knowledge, and improved machinery; hence the present rivalry.

If the London gas manufacturers are really desirous that the "trade should flourish" or that it should yield a fair profit, they must unite in the determination not to supply a *single* foot of gas in any other way than *by meter*. By adopting the course now recommended, not only will the value of gas-property be greatly enhanced, but the honest consummer will also derive a benefit from the unanimous enforcement of the regulation; for let it be remembered, gas companies are compelled to charge a higher price for their commodity in order to protect themselves in some degree from the ruinous effects of the *unmeasured* consumption of gas by one class of customers.

I cannot conclude my remarks upon this important subject, without observing, that much inconsistency prevails in the management of our gas establishments, especially as regards the registration of the quantity of gas *made and consumed*. For example 800,000 cubic feet are conveyed from a company's works every night during the winter season through the street-mains; but the directors have not the same accurate means of knowing how, or in what manner, this body of gas has been disposed of? A reference to the aggregate amount of their contracts will probably satisfy them, that the *ostensible* supply required by the customers is 6 or 700,000 cubic feet—thus showing a balance against the establishment of 1 or 200,000 feet: here in fact, is an immense body of gas manufactured for no other purpose than to be supplied gratis to unfair and unmeasured consumers.

The rights of gas proprietors in the metropolis are sadly neglected—competition, while it has benefitted the public, operates prejudicially upon the interests of the rival establishments. In such a state of things, it is imperatively the duty of directors, to protect the interests of the propriotary; and that they may do so with effect, the fair and equitable system of *supplying gas by meter* must be generally resorted to.

PETER PINDAR.

LIST OF ENGLISH PATENTS GRANTED BETWEEN THE 24TH DECEMBER 1837, AND THE 25TH JANUARY, 1838.

William Retland Pzon, of Cambridge, for improvements applicable to steam engines. Jan. 4; six months.

Henry William Nunn, of Whippenham, Isle of Wight, lace manufacturer, for improvements in the manufacture, and in the making or producing of certain descriptions of lace and other ornamental fabrics. Jan 4; six months.

Nathaniel Worsdell, of Crown-street, Liverpool, coachbuilder, for improvements in apparatus to facilitate the conveyance of mail bags and other parcels on railways or roads. Jan. 4; six months.

Bennet Woodcroft, of Mumps, Oldham, Lancaster, gent., for improvements in the construction of looms for weaving various sorts of cloths which looms may be set in motion by any adequate power. Jan. 4; six months.

John Richardson, of Hutton, Yorkshire, for certain improvements in the method of covering buildings. Jan. 4; six months.

Charles Watt, of Manchester, lecturer on chemistry, and Thomas Rainforth Tebbutt, of the same place, merchant, for certain improvements in the manufacture of the oxides of lead, and also of the carbonate of lead. Jan. 5; six months.

William Wells, of Manchester, machine-maker, and Samuel Eccles, of the same place, merchant, for certain improvements in power-looms, and in hand-looms, for weaving plain and figured fabrics. Jan. 5; six months.

Charles Fitton, woollen manufacturer, and George Collier, mechanic, both of Camberworth Half, near Wakefield, York, for improvements in power-looms. Jan. 5; six months.

John Thornhill, of Ison-green, Nottingham, lace-maker, for improvements in the manufacture of lace. Jan. 5; six months.

John Edwards, of Lincoln's-inn-fields, pen-maker for improvements in instruments used in writing. Jan. 5; six months.

Hugh Ford Bacon, of Fen Drayton, Cambridge, Clerk, for an improved apparatus for regulating the flow or supply of gas through pipes to gas-burners with a view to uniformity of supply. Jan. 5; six months:

William Southam, of Ditchford Mills, Nottingham, miller, for an improved apparatus or machine for drying corn and other grains and seeds. Jan. 5; six months.

Charles Watt, of Manchester, lecturer on chemistry, and Thomas Rainforth Tebbutt, of the same place, merchant, for certain improvements in the manufacture of the hydrate and carbonate of soda, from the chloride of sodium, applicable to the making of soap, glass, and other useful purposes. Jan. 5; six months.

Richard Bright, of Bruton-street, Berkeley-square, lamp manufacturer, for a new or improved apparatus or contrivance for effecting the more complete combustion of candles, and superseding the necessity of snuffing. Jan. 13; six months.

Edward Davy, of Fordton near Crediton, Devon, merchant, for improvements in saddles and harness for horses, and in seats for carriages. Jan. 13; six months.

Charles Barnard, of Norwich, ironmonger, for an improved mangle. Jan. 1[illegible]; two months.

George Chapman, of Whitby, York, engineer, for certain improvements [illegible] six months.

Henry Hewitt, of No. 5, [illegible] Surrey, gent., for a new or [illegible] pound or medicine, [illegible] for the cure or [illegible] and gout, lumbago, [illegible] similar nature. [illegible]

Julian A[illegible] Liverpool, architect, [illegible] propelling vessels [illegible] months.

Luke Barton, of [illegible] smith, for certain [illegible] frame-work knit[illegible]

Frederick O[illegible] medical student, [illegible] ments in clothes [illegible] months.

Ambrose Ador, [illegible] chemist, for certain [illegible] obtaining motive power.

Herbert George [illegible] wine merchant, [illegible] being a command[illegible] aboard. Jan. [illegible]

Thomas H[illegible] patent water[illegible] provements [illegible] preparing [illegible] tion which [illegible]

Robert C[illegible] for improvements [illegible]

Francis C[illegible] [Midd]lesex, Esq., and [illegible] Court, [illegible] in the manufac[illegible]

Cha[illegible] Hyde Park, Middlesex, [illegible] for certain improved means of pro[illegible] faces, sunk, and in relief, and [illegible] and also of moulding, stamping and embossing. Jan. 25; six months.

LIST OF SCOTCH PATENTS GRANTED BETWEEN THE 22D DECEMBER, 1837, AND THE 22D JANUARY 1838.

William Neale Clay, of West Bromwich, Stafford, manufacturering chemist, for improvements in the manufacture of iron. Sealed Dec. 29. 1837.

James Macnee, coach-maker, George-street, Edinburgh, for an improvement or improvements in carriages. Jan. 13.

Jehiel Franklin Norton, of Manchester, merchant, in consequence of a communication from a foreigner residing abeoad, for certain improvemen ton stoves or furnaces. Jan 15.

Daniel Stafford, of New North-street, Red Lion-square, Middlesex, gent., for improvements in carriages. Jan. 15.

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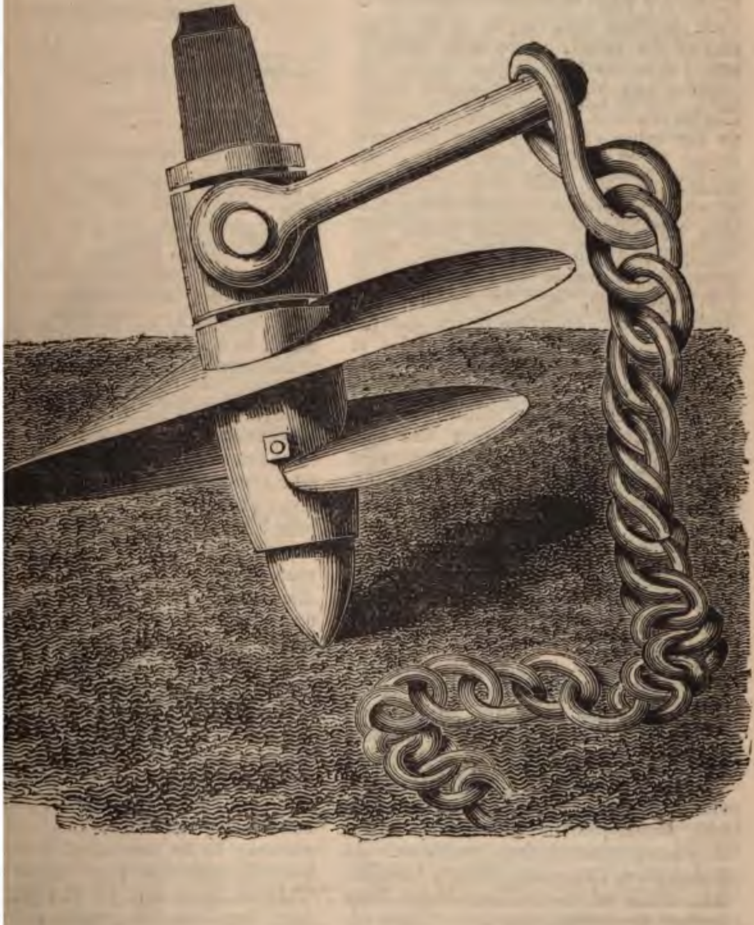
Mechanics' Magazine,

SEUM, REGISTER, JOURNAL, AND GAZETTE,

'56.] SATURDAY, FEBRUARY 3, 1838. [Price 3*d.*

MITCHELL'S PATENT SCREW MOORING.



MITCHELL'S PATENT SCREW MOORING.

Sir,—I have much satisfaction in forwarding you a drawing of Mr. Mitchell's "patent screw mooring." This ingenious invention has been cursorily described in your pages, (vol. xxvii, p. 158), but the efficacy of the new mooring having excited considerable public attention, a more detailed account of its operation, &c., is necessary, in order that the advantages of the invention may be fairly canvassed. The usual course adopted in mooring vessels of considerable burden is as follows:—Mooring-anchors or blocks are fixed as firmly as possible in such positions with respect to the situation of the vessel, as are most likely to afford security to the ships against the effect of heavy seas and gales of wind. Chains are now passed from one anchor to the other, and a sliding link and swivel is allowed to course along the chain; to this slide and swivel are attached the bridles or short cables, passing through the mooring posts, and finally secured to the cable bolts. This arrangement enables the ship to veer, to ride with ease, and to accommodate itself, to any outward forces exerted against it. In extraordinary gales of wind, however, this method of mooring vessels is not sufficiently secure; they frequently drag their moorings to a considerable distance from the spot where they are sunk, from which cause much damage ensues from collision, &c. To lessen the danger and inconveniencies of the use of the old moorings is the object of the present invention. How far the inventor has succeeded will be best shown by the following condensed statement of the reports he has received from various harbour masters:—

In the years 1834, and 1835, Mr. Mitchell, put down some of the patent screw moorings at Bristol, which were subjected to several trials. One of them had at one time two vessels of 400 tons register each, and a first class steam vessel, riding by it in a strong tide and fesh breeze; with this heavy chain they have retained their positions. At Broomelaw, Greenock, Belfast, London, &c., trials of a similar nature have *further proved their* efficacy. The testi*monials from those* places particularly *point out the* superiority of the screw *mooring as consisting* in their capability of being imbedded in the soil, thereby preventing accidents in cases of vessels grounding above them; and of their being free from the danger of vessels hooking them, or the chains, with their anchors, (the use of ground chains being avoided,) and lastly, of the vessel being incapable of lifting them by its action. These are certainly great recommendations. The application of the mooring to many civil engineering purposes need only be hinted at, to secure their adoption, in positions where other and more expensive retaining operations are now resorted to.

I am, Sir,
Your obedient servant,
C. Davy.

3, Furnival's-Inn, Jan. 25, 1838.

PNEUMATIC WATCH MAINSPRINGS.

Sir,—Had your ingenious correspondent C. H., in No. 736, ever really made a pneumatic mainspring as described by Mr. Thomas A. Ollivier, in your 699th Number, he would have had no need to enquire whether "such a motive force" would not "require a corresponding regulating power to compensate for the changes in atmospheric pressure produced by meteorological variations, or different altitudes?" Had he ever attached a train of wheels and pinions, &c. to it, he would have found what an *extremely* "delicate and accurate" measurer "of the mean atmospheric pressure" it would have been! And had he "still farther" applied the principle the use of the common mountain barometer, he would have discovered how much "more portable and less liable to deragement" it would have been.

From the *little* experience I have had in such matters, I am rather afraid that if C. H., had practically followed out any one, or all of his suggestions, he would quickly have discovered that they were verily not "deeds" but "words." For this very reason: unless his piston were so closely fitted into his cylinder as scarcely to be moveable, it would not hold air-tight for any length of time. This is borne out by the well-known fact, that even air-pumps on the best construction, when exhausted, will not resist the pressure of the atmosphere for many hours. I should imagine that th

nery attached to the piston of such nder as would be necessary to what your correspondent T. A. O., ses, (if such an one could be made) require to be wound up at the t every two hours.

either of your correspondents O., or C. H., take a small brass er, fitted with on air-tight piston, common exhausting syringe for ce, and having screwed stop-cocks th of the valves, draw the piston end of the cylinder and there con-. Let him then release it at the tion of *fifteen minutes* and see pressure there will then be on it. *very much* mistaken if the piston s the $\frac{1}{16}$th part of an inch; having f repeatedly tried the experiment n exhausting syringe of the best facture.

n sure, had either T. A. O., or ., been aware of this *single fact*, r the one would have proposed, e other offered any suggestions on ject, with the practical part of , neither of them could have been-ghly acquainted.

aning no offence to either party, erely wishing to set the matter in per light, that none of your numer-aders might be led astray, Macin-n-ball-and-magnet-fashion, to the uction of an instrument that never answer the purpose for which it esigned,

I am, Mr. Editor,
Your's respectfully,
J. FORDRED.

ton, Jan. 20, 1838.

NCH ASPHALTIC PAVEMENT.

—I have just read a long article in 754th number on the various appli-s of the Asphaltic Mastic of Seyssel. gst other announcements connected his subject, it is stated, that "pre-ons are now making for applying sphaltic mastic of Seyssel on a part Greenwich Railway, with a view to ve the arches of that extensive via-from damp; also a foot pavement eral of the metropolitan parishes, n one of the principal streets of pool." Now, Sir, without giving *elves the trouble to send to* Seyssel *cumbrous material*, if they will *k back about twelve years* into the pages of your Magazine (vol. 6), they will see, that by mixing road scrapings with a little chalk or lime and coal tar, a substance will be formed on garden walks or roads, as hard as stone, and perfectly impervious to water, so much so, that water will not wet it, even externally.

About the same time, you also gave to your readers my "Hints to Paviours", the principles of which have been highly approved of by yourself, as well as the Editors of the Times, Herald, and Monthly Repository, but the public are still made to suffer and to pay for the most stupid jobbing paving that the abusers of a public purse could possibly devise!

It is said that Oxford-street is to be restored from the macadamized to the paved state; if so, I strenuously advise those who have to *pay* for it, to peruse your and my observations on the subject of pavements, combined in a pamphlet sold by Mr. E. Wilson.

All the expensive and laborious appliance of gravel, and over that broken granite, and then new large stone, and then liquid mortar, in the pavements of Cheapside, Holborn, the Strand, &c. have lasted just ten days; after which we have always seen fifty men employed in pulling up parts that had sunk, and working away with their ridiculous hand-rammers, in twenty places of the grand new pavement! After twelve months the same great thoroughfares stopped up, and all the traffic stayed, in order to repave them!

How long the men who have to pay for these vagaries will shut their eyes to the truths which I have told them,—is a matter of indifference,—not to the public, but, to

Your obedient servant,
F. MACERONI.

Jan. 24, 1838.

WHITELAW'S IMPROVEMENT IN THE TURNING LATHE.

Sir,—I send you the following account of an improvement in the turning lathe, by Mr. James Whitelaw, who has made various communications to the *Mechanics' Magazine*, under the hope that it will be deemed worthy of a place in your useful publication. It has been found very beneficial in turning cast-iron articles of large diameter, which do not present a continued surface for the

tool to act upon, such as the arms of a wheel, the projecting parts of a clutch, &c.

The improvement can be applied to any turning lathe with a slide rest, in one with the ordinary back speed; no farther alteration is necessary than to leave the toothed wheel which revolves slowest, loose, instead of being keyed upon the spindle of the lathe; the said wheel, however, communicates its motion through the medium of catches upon it, to another with ratchet teeth, which latter is fixed upon the spindle. By this means it will be observed, the workman can at any time take hold of the chuck, or article in the lathe, and give it a motion quicker than what the spindle would have given it, if keyed in the common way to the wheel first mentioned.

To explain further, let it be supposed, that a cast iron plate having projecting snugs on it, which require to be adjusted in the lathe, is chucked in the ordinary way; then, as soon as it is in motion, and a cut taken of one snug, the workman takes hold of the chuck, and brings another near in contact with the tool; one of the catches already spoken of, then holds into the ratchet-wheel, fixed upon the spindle, and carries the snug part over the tool. By carrying the spaces thus rapidly past the tool, the projecting parts are made to present to its action nearly one connected surface, and on this account a great deal of time is saved.

The person attending the lathe has very little trouble in giving the chuck the motion alluded to, as the spring of the parts, and the friction of the cone upon the spindle assist him greatly.

Trusting that the above description will be found interesting to your readers,

I remain, Sir, yours respectfully,

JOHN B. MITCHELL.

Glasgow, Jan. 20, 1838.

SOLUTION OF THE HOROLOGICAL QUESTION, BY A LADY.

Question.—It is now twenty minutes past six o'clock, what time must elapse, when the arch intercepted between the hour and minute will be bisected by the second hand? (See No. 749, page 170.)

Solution.—At twenty minutes past six o'clock the distance of the hour hand from twelve will be $31\frac{2}{3}$ parts, of which the whole dial plate contains sixty. Let x equal to the number of parts, the second hand must move over when it bisects the arch intercepted between the hour and minute hands, $\therefore \frac{x}{720}$ and $\frac{x}{60}$ will be the parts passed over by the hour and minute hands, in the same time the second hand moves over x parts or seconds. Hence, $31\frac{2}{3} + \frac{x}{720} - \left(20 + \frac{x}{60}\right) = 11\frac{2}{3} - \frac{11x}{720}$ is the number of parts between the hour and minute hand; consequently, $\left(11\frac{2}{3} - \frac{11x}{720}\right)\frac{1}{2} = \frac{35}{6} - \frac{11x}{1440}$ is the number of parts that measure $\frac{1}{2}$ the intercepted arch contained between the hour and minute hands; therefore, the second hand has to pass over $\left(20 + \frac{x}{60} + \frac{35}{6} - \frac{11x}{1440}\right)$ parts: hence, we have $x = 20 + \frac{x}{60} + \frac{35}{6} - \frac{11x}{1440}$; from which equation we find $x = 26\frac{98}{1427}$ parts or seconds. Hence, the required time is 20 minutes $26\frac{98}{1427}$ seconds past 6 o'clock.

L. A. S.

P.S.—In reading the controversy between Mr. Utting on the one side, a Scotch Dominie and a Cambridge Student on the other, I have arrived at this conclusion: Suppose the precession of the equinoxes of all the planets were to cease, but every thing else to go on as at present, it would make no difference in the synodic periods of the planets. If I am wrong, I will thank any of your able astronomical correspondents to prove the contrary.

MEAN SOLAR, AND APPARENT TIME.

Sir,—I have lately completed my set of the *Mechanics' Magazine* by the purchase of the early volumes; and in the perusal of the whole series, I meet an inexhaustible fund for entertainment, instruction, and reflection: indeed there is scarcely a branch of science, either practical, or theoretical, on which some light is not thrown. In pondering ove

the various discussions which have, from time to time, been carried on through its medium, most valuable hints for self-government, under similar circumstances may be attained:—on the one hand, by comparing the degree of tact and management displayed in an argument, with the success it may have obtained over an opponent; and on the other, by seeking to account for the circumstance of so many questions having been left apparently undecided, neither disputant being disposed to yield to his adversary, but as if each were wearied out with ineffectual attempts to convince the other.

I have, Sir, no wish to waken up long forgotten disputations, where the interest attaching to them has been merely temporary; but, there is one question, of paramount importance, the dispute on which extended over three volumes of your Magazine; and yet, at the end, so inconclusive was the mode in which it was argued, it was left as undecided as when it began; and not only would a person (not otherwise conversant with the subject,) be at a loss to determine on which side the truth lay, but he would be in danger of leaning to the side of error, from the circumstance of its advocate having been left in possession of the last word; and that, too, an apparently triumphant one.

The dispute to which I allude, is that between Vectis, and Mr. Squire, on the one part; and Rus Astro, Mr. Utting, and Henry H. on the other; respecting siderial, mean solar, and apparent, time: wherein the former, contended that the differences of times, at one and the same instant, under two distant meridians, are equal and synonimous in all three denominations; and the latter, that the said differences are unequal and incongruous.

This question, which appears of so perfectly plain and practical a nature, was started in your eighth volume, and was concluded, or rather suffered to drop, in the tenth vol.; Mr. Utting was *most clearly in error;* yet so far were his opponents from convincing him of it; that, from any thing appearing to the contrary, he is of the same opinion to this day.

My reasons for again bringing it under your notice, are these:—

First: Because a question so important, and so purely practical, should not be left exposed to the slightest doubt or uncertainty.

Secondly: Because, in my opinion, had the original, *practical* question been more rigidly adhered to; namely, whether, a certain process had, or had not, been correctly performed; the discussion, instead of extending throughout three volumes, might have been disposed of in as many pages.

Lastly: Because it is abundantly evident, that many persons (in other respects not ignorant in such matters) partake in Mr. Utting's delusion; in proof whereof, I beg to point out the letter of "A Country Teacher," occurring so lately as your 25th volume, page 224; wherein the very error that misled Mr. Utting, is made use of by the Country Teacher to refute the utility of a proposal of Mr. Waldron's for making ship's chronometers keep siderial time; and yet the erroneous calculation has ever since remained unquestioned, even by Mr. Waldron himself; whose scheme, had it been obnoxious to no other objection, might easily have been defended from that.

After this preface, I shall proceed at once to work. I shall examine the two prominent examples in the former discussion, together with this very opportune one, of the Country Teacher; and I shall show that they are, all three, erroneous in the very same point. This I shall do by the aid of two plain rules, extracted from the *Nautical Almanac; so that there shall be no room for cavil:* and here let me remark, that had Mr. Squire, adopted this method, at page 276, vol. x, instead of his long sarcastic letter, filled with supposititious, analytical, reasoning, he would have been much more likely to have convinced Mr. Utting of his error.

In the "Explanation of the Articles," accompanying each volume of the *Nautical Almanac*, may be found the two following rules:—

1st, "Convert the interval from the mean noon immediately preceding, from the denomination given, to that required; and if mean time be required, the result will at once be that which the clock should show; but if siderial time be sought, the result must be added to the siderial time at the preceding mean noon."

2d, "If the place of observation be not on the meridian of Greenwich, the siderial time at Greenwich mean noon must be corrected by the addition of 9".8565 for each hour (and proportional parts for the minutes and seconds) of longitude, if the place be to

the west of Greenwich; but by its *subtraction*, if to the east."

The reason for this last rule is obvious; for, as the sid. time at noon is a *variable* quantity, it cannot be the same for the noons of different meridians; and yet, it is by the neglect of this rule, that Rus Astro, Mr. Utting, and the Country Teacher, have all severally fallen into the same mistake.

1st, It was in calculating the sid. time of the event at the 2nd *Meridian*, that Rus Astro was in error. Vide vol. viii, page 175.

At Greenwich.

	h m s
Sid. T, at M.N.	0 . 0 . 0
Mean interval 6 . 34 . 15	
Equiv^{t}. sid. interval	6 . 35 . 19·77
Correct sid. time	6 . 35 . 19·77

At 2nd Mer^{n}. 7 . 32 . 10 East (h m s)

Sid. T: at Green^{h}. Mean Noon	24 : 0 : 0
Correct^{n} per rule 2nd ..	0 : 1 : 14·28
Sid. T at M.N. at 2nd Mer^{n}.	23 . 58 . 45·72
Mean interval 14 . 6 . 25	
Equivalent sid. interval	14 . 8 . 44·04
Correct sid. time	14 . 7 . 29·76

Hence, at Greenwich Mean time = 6 . 34 . 15 Sid. time = 6 . 35 . 19·77
" " 2nd Mer^{n}. " " = 14 . 6 . 25 " " = 14 . 7 . 29·76

Differences .... 7 . 32 . 10 7 . 32 . 10

2nd, It was also in calculating the sid. time for 2nd Meridian P, that Mr. Utting was in error. Vide vol. ix, page 422.

At Greenwich.

1827. Feb. 20.	h m s
Sid. T, at M.N, =	21 : 59 : 32·28
Mean interval 0 . 0 . 0	
Equiv^{t}. sid. interval	0 : 0 : 0
Feb. 20. Correct sid. time	21 . 59 . 32·28

1827. Feb. 19. At 2nd Mer^{n}. P, 8 . 0 . 0 West. (h m s)

	h m s
Sid. T, at M.N. Green^{h}	21 : 55 : 35·72
Correct^{n} per rule 2nd +	0 : 1 : 18.85
Sid. T, at M.N, at P.	21 : 56 : 54·57
Mean interval.. 16^{h} . 0 . 0	
Equiv^{t}. sid. interval ..	16 : 2 : 37·70
Feb. 20. Correct sid. time	13 . 59 . 32·27

Hence, difference of longitude in mean time = 8^{h}
ditto " ditto " sid. time 8^{h}

3rd, It was in calculating the mean time of transit at ship, for Regulus, that the Country Teacher was in error. Vide vol. xxv, page 224.

March 31, 1836.

	h m s
R. A. of Regulus	9 . 59 . 39
Time per sid. Chr^{r}	11 . 10 · 20
Diff^{ce} of longitude	1 : 10 41

	h m s
Sid. T, at Green^{h} M.N.	0 : 35 : 33·54
Corr^{n} for 1^{h}.10^{m}.41^{s}W.long. +	0 : 0 : 11·61
Sid. T, at ship's M.N.	0 : 35 : 45·15
R^{t}. As^{n}. of Regulus	9 : 59 · 39
Sid. interval	9 : 23 : 53·85
M^{n}. Equiv^{t}. is M^{n}. T. of trans^{r}.	9 . 22 . 22·5
M^{n}. time at Greenwich....	10 : 33 : 3.5
Difference of longitude	1 . 10 . 41

I trust, that I have now placed the question in such a simple and practical shape, that conviction, must of necessity follow; and that, as Mr. Utting is still

t and valuable contributor to *chanics' Magazine*, he may see cessity of acknowledging the in- ness of his former views; and that if the several reductions perly performed, it is quite im- l in which of the denominations , differences of longitude may be I have not adverted to apparent imply because of the additional t would have occupied, but it very easily be shown, not only also would give the difference of de correctly, but that in some is a more direct way of obtaining mean time.

I remain, your very
obedient servant,
NAUTILUS.

n. 13, 1838.

CHING SILK AND WOOLLEN GOODS.—INQUIRIES.

—Is there any better process of ng silk and woollen goods than g them to the vapour of burning ? This process answers well as iving a very white colour, but it a very unpleasant sulphurous the goods. Another objection , the injury which the workman s in removing the goods from the vapour in the stove. The stove iich I am connected has several oors which are thrown open some before removing the goods, and vapour is confined in the folds woollen pieces. Can any artificial be suggested of drawing this va- ff? The same difficulties were y experienced in bleaching cotton rine gas; can any combination or other substance be formed lphur, destroying its smell, but ing its bleaching property? I is subject well worthy the atten- practical chemists. While science under obligation at every step in tton manufacture, it has done atively little for that of the wool- In conclusion, I would merely , that what is wanted is—a bleach- nt capable of acting on woollens (those which bleach cotton and ll not) without any unpleasant *or which smell may be* removed *further process*.

improvement on the system of *ith sulphur* cannot be suggested, I should much desire to have the best account of conducting this operation either in this country or in France, where sulphur was extensively used in bleaching silk.

Your's, &c.
AN OLD READER.

Jan. 22, 1838.

MECHANICS' INSTITUTIONS IN WALES.

SIR,—I hope you will excuse the liberty I take in contradicting a statement that appeared in your Magazine of the 13th inst. (No. 753), wherein you say that "Mechanics' Institutions did not make their appearance in the principality of Wales until about two years ago, when the inhabitants of Aberystwyth opened an institution in that remote town, being the first Mechanics' Institution ever opened in the principality."

Although this is in itself a matter of little importance, its having been mentioned in your valuable Magazine renders it necessary that the truth should be told. The fact is, that there was a Mechanics' Institution in the neighbourhood of Merthyr Tydvil in 1830, called the Dowlais Mechanics' Institution; it was established under the powerful patronage, and by the assistance of the proprietor of the Dowlais Iron works, J. J. Guest, Esq., M.P. I will not take upon me to say that this was the first institution that was opened in Wales; but, if it was, this will show that though the Welsh mechanics were not so early in the field as those in the English towns, they were not quite a *dozen* years behind them.

I beg to apologize for thus troubling you, but I deemed myself called upon to say thus much in gratitude for the benefits I have derived at this institution, from the lectures delivered, and from attending the reading room, where I first derived pleasure and instruction from the columns of the Mechanics' Magazine.

I remain, Sir, &c.
R. N.

Southwark, Jan. 23, 1838.

DAVY'S ELECTRIC TELEGRAPH.

SIR,—Perceiving an article in No. 754 of the Mechanics' Magazine, on the subject of electric telegraphs, in which your correspondent appears to augur

superlatively beneficial results to society therefrom, I was induced yesterday, by a notice at the door, to visit the telegraph exhibiting at Exeter Hall. It is that of Mr. Davy, mentioned by your correspondent; and a more beautiful thing I certainly never saw.

There is a case which may serve as a desk, to use in writing down the intelligence conveyed; and in this there is an aperture about 16 inches long and 3 or 4 wide, facing the eyes, perfectly dark. On this the signals appear as luminous letters, or combinations of letters, with a neatness and rapidity almost magical. The field of view is so confined that the signals can be easily caught and copied down without the necessity of even turning the head. Attention, in the first instance, is called by three strokes on a little bell; the termination of each word is indicated by a single stroke, and the end of the communication by two strokes. There is not the slightest difficulty in decyphering what is intended to be communicated. I observed two young ladies talking in French by means of the telegraph.

This exhibition is accompanied with a variety of interesting experiments, the room lighted by an enormous galvanic battery, and altogether, I have seldom passed an hour more amused. But however highly delighted at that exhibition, I have found myself quite unable to reach the pitch of enthusiastic anticipation expressed by your correspondent "Inquisitivus." I have not yet heard that any one has invented a tube adapted for carrying the wires across the seas, in spite of fish, sharks, anchors, fishing drags, sea-water corrosion, and, above all, enormous expense. How, then is, the convict in Sydney to carry on this instantaneous correspondence with his untransported fellow-housebreaker in the great metropolis? And with what safety could the wires, though enclosed in tubes of triple steel, be laid across the deserts of Arabia, or even along the common road in this comparatively civilized country? I think every one serious in the matter must perceive that this invention, though perhaps in a certain sense it may be said "to save half the valuable *time of the world,*" is yet not sufficient *to make the world* a heaven, nor even *("per galvanism")* as one family, all at *once.*

It is clear that with anything like security, the wires could not be laid down, except on railways, or along some such protected lines; under other circumstances it would be necessary to station men on the watch every half mile. On railways, I readily admit the applicability of the electric telegraph, not for the purposes of Government only, but as a medium of communication open to every individual; and I believe, it is an invention likely to be productive of great, though not supernaturally important, results, to society.

I am, Sir,

Your constant reader,

MODERATUS.

WILSON'S WINDOW SASH SUSPENDER.

SIR,—Annexed I hand you an extract from the 32nd vol. of the Transactions of Society of Arts, 1814, which, if made generally known in your pages, may be more acceptable to some of your readers on the score of expense, than the patent method, described in your 711th Number.

I am, Sir, &c.

R. PROSSER

Birmingham, Jan. 4, 1838.

Fig. 1

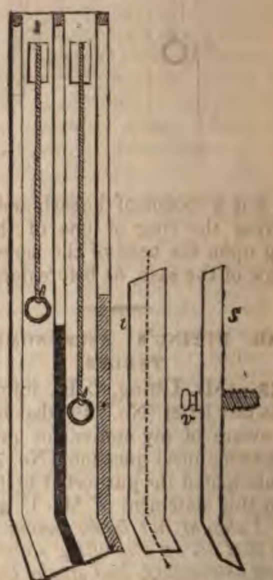
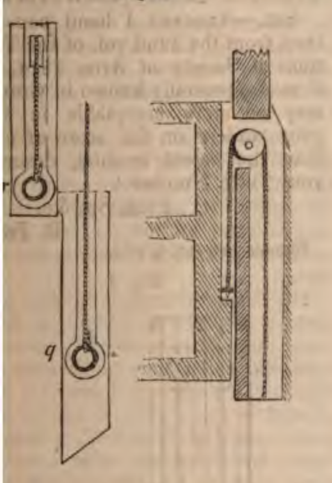


Fig. 1 is a "section of a sash win

, the sash lines having rings fas- to them to hook on to or off the of a screw placed in a hollow made side of the sash, as at q and r at ottom of the grooves, which are ade in the sides of the sash for the each screw-head is flush with rface, so that the rings cannot get ilst the sash is in its place; s and esent the lower halves of the bead iddle slip, one of which will stick place, and the other can be fas- by the screw v. These will take o that both sashes can be taken he room and the sash line separated them; and they may there be d or repaired without the danger- ouble of going outside the window.

Fig. 2



: is a section of the sash and pulley, ng the ring of one of the lines, upon the head of the screw in the v of the sash, as before described."

R. UTTING'S ASTRONOMICAL TABLES.

,—Mr. Utting, C. E., informs me last letter (No. 749) that he "was ware of my motive for proposing tronomical question (No. 734), as ticipated the purport at first sight." this statement of Mr. U.'s, I sup- I *should not be far wrong* if I in- *that he, on consulting* some of his *on astronomy, had* made the dis- *that the astronomical* rules which he has promulgated in the *Mechanics' Magazine*, were all founded upon a bed of sand. If such was the case, he ought at once to have admitted his errors. But if, on the contrary, he was perfectly satisfied of the soundness of his principles, then, I say, he had no right to suppose that I could have had any other motive for proposing the question than that of ascertaining whether the Scotch Dominie or he were right, in the two different methods they have given for determining the mean synodic periods of the planets. If the Dominie is wrong, so is every writer on astronomy that I have ever read upon this subject. If Mr. Utting is right, all that he has got to do is to give us a demonstration of the truth of his principles.

At page 107, vol. 28, (No. 749), col. 2, line 6, Mr. U. remarks, "for $\frac{P}{n-P}$ (not $\frac{P}{n-p}$ mind) = 487, read $\frac{P}{p-P}=487$" (!!) &c. Here Mr. Utting is determined not to be misunderstood. Be it so. Well, this equation of his $\frac{P}{p-P}=487$, does involve one unknown quantity, namely, p, and as Mr. Utting has not found the value of p from the same equation, $\frac{P}{p-P}=487$, I beg leave to supply the omission. Well, then $p=\frac{488\ P}{487}=P+\frac{P}{487}$. Then, according to Mr. U.'s value of P, viz. $365\frac{1}{4}$, hence, we have $p\,365\frac{1}{4}+\frac{365\frac{1}{4}}{487}=366$ exactly; but n the synodic period, is exactly 366. (See No. 741, page 36). Hence, according to the Uttonian theory, it appears to be perfectly possible for a planet to have its synodic and siderial periods exactly of the same length of time. To make any comments upon this third grand astronomical discovery of Mr. Utting's, would be an insult to the understanding of every reflecting reader of your excellent Magazine who may have paid some little attention to the movements of the planets.

Mr. Utting then proceeds to make some remarks on what I stated (No. 745) to be the limits of the astronomical equations $x=D\left(\frac{n}{n-P}\right)^{\frac{2}{3}}$, and $x=D$

$\left(\frac{n}{P+n}\right)^{\frac{2}{3}}$, (see No. 745); and here I will inform Mr. Utting that he has displayed the same degree of algebraic knowledge, in *his way*, of deducing the limits of the above equations as he has exhibited in the discovery of his own astronomical equation $\frac{P}{p-P}=487$ (!) Indeed, Mr. U. having clearly demonstrated that he cannot rightly manage the simplest of all simple equations, it could hardly be expected that he could have been more successful in tracing the limits of equations of a more complex order.

Mr. Utting then presents us with the length of a mean tropical year, as given by some of the greatest astronomers of the past and present age; in which it is seen that none of them agree in the length of the tropical year, there being no less than 4 seconds of difference between that of Bessel and La Place, and that none of these great men have given the decimal of a second to more than one place. Mr. Utting very modestly associates his name among these great astronomers, no doubt for the purpose of forcing us to believe that he has succeeded by some (as yet unexplained) method of determining the length of the tropical year, true to the ten thousandth part of a second! But of what use is it to give the length of the tropical periods? It is not from these periods (as the Scotch Dominie has fully demonstrated) that the synodic periods are computed, but from the siderial periods. Let, then, Mr. Utting give us a table of the mean siderial periods of the planets, together with the procession of their respective equinoxes, such as he used in calculating his tropical periods, then we would have something to grapple with. If he should do so, then I will undertake to show that none of the tropical periods that he has given in his astronomical tables are to be depended upon, and with regard to his grand period of conjunction, this he has computed upon false principles.

Yours, &c.

A CAMBRIDGE STUDENT.

Jan. 18, 1838.

SEASONABLE HINTS, BY COL. MACERONI — WARMING AND VENTILATING, FUR CLOTHING, WOODEN SHOES, NEW WARMING-PAN, WATERPROOF BOOTS AND SHOES.

SIR,—I have been much gratified by the perusal of Dr. Ure's paper on the warming and ventilation of habitations. It is quite astonishing to see French and German "*inventors*" bring over to this country stale ideas of every description, in every branch of industry, in perfect apparent ignorance of such having been tried here years and years ago. I am continually receiving communications from Paris and Germany concerning some grand discovery in candles, soap, gas, &c., that have had the changes rung upon them in this country to utter exhaustion—not *exhaustion* perhaps, but far beyond the ken of the dreamers, who do not take the trouble to enquire about what *has been done*, in respect to the crude ideas they hastily seize upon as new.

I wonder that your correspondent's gas stove (Evander's) has not been more noticed. It lets out no residuum into the apartment, and the application of a cup of water on the top, will give the necessary humidity to the respiring medium.

The common fireplace is, after all, the best for domestic purposes. It is quite true, that stove-warmed rooms give headache, and a very unpleasant sensation in the nose and bronche. A hole pierced in the wall of the chimney, about one foot from the ceiling of a room, and furnished with a revolving vane, such as we see in kitchen windows, will allow of all the exhalations from the people in the room, going into the chimney.* It is most extraordinary that all the writers on warming, ventilation, &c., suppose that the carbonic acid resulting from respiration, falls towards the floor, But no such thing; and I am happy to be joined by Dr. Ure in saying, that it rises to the ceiling, of which I have often been convinced by visiting the upper regions of a playhouse, &c. Ergo, the hole in the chimney near the ceiling of a room, will cause all the upper stratum of air to be drawn into it. There is no fear of the

* See Mechanics' Magazine, vol. xxvi, p. 318.

smoke ever coming out of the chimney into the room, as the air in the former will always be the hotter, *when once the fire is lighted.*

The cold weather reminds me of a sermon I have been preaching on the subject for the last twenty years. All the "great coats" of cloth, one over the other, even so as to make it impossible to move your arms, will not keep you half so warm as a simple cloak or jacket of fur. Now (expensive furs apart), we can get a jacket, trousers, or boots of sheeps' skin at a very moderate cost; and having only need of using them in very cold weather, they would endure many years. Were the policemen, the poor labourers, stage coachmen, &c. &c. to get them a jacket of sheep skins, they might sleep on the snow in the open air in the frost of Russia, as warmly as in their beds at home. I have slept in the open air on the Alps, the Appennines, and the Pyrennees, in the midst of winter, covered by a cloak lined with wolf skin, and been as comfortably warm as in a city bed. Nothing but fur of some kind, will keep out the cold, or rather keep *in* the warmth. Woollen *tissues* admit the escape of the caloric, and the entrance of the blast. The peasants in all countries liable to cold winters, invariably use sheepskin dresses—but not so in England. Here, you will see the poor with ragged shoes—their feet slopping in the mud or snow. But who—what *Briton* would demean himself by putting on a comfortable pair of sabots or wooden shoes, lined with sheeps' fur! They would keep his feet too dry and warm; besides, they are French, and vulgar, and make such a clatter on the road! Policemen, and all sorts of watchers, coachmen, guards, &c., all ought to have fur coverings. The wool, well brushed, being placed outside, acts as a thatch against the rain. In the most intense frost it may be worn inside, but there is little difference in the protecting power from cold. The fact is, that in this country we have no certainty of either a summer or a winter. Some seasons we have a warm winter, and a cold summer; so no sort of provision is made, either in our architecture, artificial *warming, or clothing.*

By the bye, in 1814, I caused an iron*monger opposite Bishopsgate* church, *to make me a warming-pan* for the use of hot water instead of live coals. A cork stopped it up like a bottle, and all the smell, overheating, &c. of the latter material were avoided. I have not seen any such since.

I will not conclude without inviting the attention of your readers to a cheap and easy method of preserving their feet from wet, and their boots from wear. I have only had three pair of boots for the last six years (no shoes), and I think that I shall not require any others for the next six years to come! The reason is, that I treat them in the following manner. I put a pound of tallow and half a pound of resin into a pot on the fire; when melted and mixed, I warm the boots and apply the hot stuff with a painter's brush, until neither the soles nor upper leathers will suck in any more. If it is desired that the boots should immediately take a good polish, dissolve an ounce of bees' wax in an oz. of spirits of turpentine, to which add a tea spoonful of lamp black. A day or two after the boots have been treated with the tallow and resin, rub over them the wax in turpentine, but not before the fire. Thus the exterior will have a coat of wax alone, and shine like a mirror.

Tallow or any other grease becomes rancid, and rots the stitching as well as the leather, but the resin gives it an antisceptic quality which preserves the whole. Boots or shoes should be so large as to admit of wearing in them cork soles. Cork is so bad a conductor of heat, that with it in the boot, the feet are always warm on the coldest stone floor.

This is a bad recipe for the bootmakers, as I find that myself and children consume fewer boots or shoes than other folks, in the proportion of one to five. My boots, although covered with nails, will of course wear away at last, in the daily friction over ten or twenty miles of gravel and pavement; but I have had them soled three, four, or five times, while the upper leather is as good as, or better than, new. Upon taking off my boots after walking all day in the wet, the soles are as dry as a wax candle would be, on being taken out of the water and wiped. The trumpery spongy leather used for children's and women's shoes, becomes, under my treatment, dense, smooth, waterproof, and lasting. A few little nails at the heels, side, and

toes, greatly contribute to the endurance of the shoe, which is of much importance to a poor man, besides the feet being always dry. I have tried a solution of India rubber, but although such as I have had, certainly are waterproof, they have remained sticky and imperfectly condensed. Copal varnish, with the addition of an equal quantity of raw linseed oil, is a good substitute for the tallow and resin mixture, but it requires a considerable time to dry, and must be repeated several times. The other fills up the pores of the leather at once, if the operation be properly done before a good fire. As you, Mr. Editor, have no vested interest in the destruction of shoes and boots, or in the effects of colds, coughs, and deaths, I trust you will not delay the communication of this letter to your readers. I have practised and preached the application twenty-seven years.

Your obedient servant,

F. MACERONI.

Jan. 28, 1838.

COL. MACERONI'S STEAM-CARRIAGE LABOURS.

Sir,—In thanking you for the insertion of my letter in reference to the enquiries of L. M B., about common road steam-carriages, I take the liberty of observing, that you have omitted some portions of my communication, which had no reference to anything before made public. For instance, Sir, it has never been published that Messrs Baxendale, Tatham, Upton, and Johnson, the eminent solicitors, attempted last summer (1837,) to form a company for the construction of steam-carriages under my direction, of which I sent you a proof prospectus. The written opinion also, of Mr. Alexander Gordon, as to the merits of my new boilers, has never been published, in which he states, that he "considers them quite new in construction, differing essentially from other boilers of small chambers or compartments, and for all purposes of locomotion, superior to any other known to him." In using this boiler, there exists *absolute* safety; as it consists of above a hundred separate *cylinders of the best* charcoal plate, four *inches diameter*, so that no explosion *can possibly* take place. This boiler *weighs only* 70lbs. per horse power; it has no chimney nor draught through it—*ergo*, no sparks, &c. No fire-bars—*ergo*, no burning out, nor clinkers. A boiler of four feet each way, is of twenty-five horse power, converting three gallons of water per minute into dry steam of from 200lb to 300lbs. pressure on the safety valves. This boiler is equally at the service of railroad directors, of steam navigators, or of attemptors at common road locomotion.

L. M. B. will naturally ask, how it is, that since I have asserted that my steam carriage succeeded so well, did it on a sudden disappear? I therefore, beg you will allow me now to state, that just as I was on the point of reaping some benefit from my labours, a foul conspiracy of pretended friends, so placed me "between the frying-pan and the fire," as to *compel* me to allow my steam-carriage, together with a much larger and most beautiful one I had just finished, to be taken to the continent. The latter was taken to Paris, where it was run for six weeks to St. Germain, outstripping all coaches, gigs, and horses, even up the long steep hill. The King of the French rode in it. The party who had my engines mismanaged his business, but nevertheless pocketed 12,000*l.*, of which he did not remit me, the proprietor, one shilling! But I have no remedy, neither do I know what is become of either of the carriages, except that a Parisian engineer persuaded the man to let him take the larger carriage to pieces, (for what I do not know,) and he could not, or has not, put it together again.

Thus I was deprived of both my steam-carriages. My factory was stripped of lathes, tools, steam-engines, &c. to the value of 2500*l.*, and I lost every thing. Now, when Mr. Baxendale collected together a dozen friends to form the company, of which you have the prospectus, he found it impossible to complete his arrangements, unless I had a carriage to exhibit to several influential men, who had never ridden in my carriage. So the affair remains in abeyance.

With regard to my new boilers, I am unable to exhibit the models to your readers or to the public, because I have not the means of taking out the patent; and this is the result of the present state of the English patent law. No amendment is worth consideration unless the ex

ortionate fees and expenses which carry the cost up to 300 or 400*l*. for the United Kingdom, are abolished. These sums go to increase the emoluments of public officers who are already over-paid.

Hoping soon to see the community benefitted by a radical change in the law in this matter,

I am, Sir, &c.

F. Maceroni.

Jan. 28, 1838.

THE SOCIETY OF ARTS

From the appeal to the public in behalf of the Society of Arts, a copy of which appeared in a recent number of the *Machanics' Magazine*, it would appear that the venerable association is on its last legs. Is this a state of things very greatly to be deplored? Most people will be inclined to answer the question in the negative, on the showing of the secretary's statement alone. That statement speaks grandiloquently enough of what has been effected by the society, in the way of encouraging "the application of science to the improvement of the practical arts," but, when it comes to a something in the shape of a detail of the particular improvements "for which the practical arts" have been indebted to the "encouragement" of the society, what is the result? The product of the society's labour of love vanishes into thin air.

It cannot be denied that the "practical arts" have advanced most rapidly in the period that has elapsed since the formation of the society,—a period of no less than eighty-four years;—but, then, it is equally clear, that the society has had nothing to do with this advancement. From 1754, when it took its origin, to 1837, in which it became necessary to appeal to public sympathy for the preservation of its existence, its history is still the same. All the gigantic improvements for which the last and present age will ever be distinguished, have been invented and brought to perfection within that period, yet the worthy secretary, straining his utmost to adduce the *strongest possible reasons for* the public *support now so urgently* asked for, cannot *appeal to any page* of the society's *annals, which records* the assistance afforded by it to the struggling man of genius in his hard contest with want of means, and a thousand other difficulties, nor the "encouragement" by which a single step has been gained in the introduction of any grand improvement to general use.

Does the society urge, that the nation owes it a debt of gratitude for fostering those wonderful inventions which have led to the amazing extension of the cotton manufacture? No: that was effected by an individual. Does it claim any merit on the score of its share in the production of that mechanical miracle, the steam-engine? No: the honour belongs solely to Watt, and *his* sole pecuniary encouragement was derived from an individual. Does it breathe a whisper of its having contributed to the enlightenment of the age by its early patronage of gas? No; the rooms of the Society enjoyed the "darkness visible" of the old system, while a neighbouring printseller attracted all London by exhibiting the 'new light' at his individual expense. Not to lengthen the list, does the Society, finally, draw attention to its exertions in the field of locomotive improvement,—the distinguishing feature of the present day, so far as the "practical arts" are concered. Does it take credit for "encouraging" steam navigation, railways, and steam locomotives? No; such things have indeed been "encouraged," or have started into being without encouragement; but either way the Society has had nothing to do with the matter!

What, then, are its claims to notice? According to the secretary's statement, the grandest benefits it has conferred upon the community have been the introduction of some new branches of the carpet manufacture, and of an improved mode of supplying fish to the London markets. These are not objects of anything like national importance; nor is either calculated to buoy up a sinking society, which can only point to two such feats after an existence of upwards of eighty years. Of the improvements in the carpet manufacture little need be said, except that it would be ludicrous to compare them to improvements in other branches of manufacture of incomparably greater extent, which have thriven a thousand times more without the Society's aid;—as to the "supply of fish," most assuredly it is not now at

all such as it ought to be, nor such as it will be as soon as the railways to the coast (in which the Society has neither art nor part) shall have come into operation. Their unencouraged efforts will effect more in a few months in the way of supplying the metropolis with fish, than the Society has ever effected since its first establishment.

It may be doubted whether such an institution as the Society of Arts is ever of real utility; it admits of but little doubt, that its exertions are not required in the present state of the "practical arts." It has had no more to do with the progress of useful science since the date of its birth, than the fly on the wheel with the movement of the coach; and the injudicious attempt to unite the "encouragement" of the fine arts with its other and higher objects has had a highly injurious tendency. The distribution of gold and silver medals to masters and misses for the production of pretty pictures, may be very pleasing to their friends, and other parties concerned, but it throws a ludicrous light over the proceedings of a solemn society. If the Society of Arts should really be able to "take a new lease of life," let it by all means become a "Society of the *Useful* Arts" alone.

ON HYDRAULIC AND COMMON MORTARS. BY GENERAL TREUSSART, INSPECTEUR DU GENIE.

[Translated from the French by J. G. Totten, Lt. Col. of Eng. and Brevet Col. United States Army for the *Franklin Journal*.]

ART. 1.—*On the present state of our knowledge of Lime.**

Lime has been employed from time immemorial. Mixed with sand, or certain other substances, it forms what is called mortar. Although the solidity and durability of masonry depends on the goodness of mortar; still, few experiments have been made with lime; and the manner of making mortar has almost always been given up to workmen. It is only within about fifty years that a few scientific men have attended to this important subject. Comparing the mortars of the ancients, and especially of the Romans, with those of modern times, it was perceived that the old mortars were much better than ours; and the means have, consequently, been sought of imitating them. Several constructors have thought they had discovered the secret of making Roman mortars: others, on the contrary, have thought that the Romans had no particular process, but that, of all their constructions, those only which were made of good lime had survived to our day. We shall see that my experiments tend to confirm this latter opinion.

Lime used in building, is obtained by the calcination of calcareous stones, which occur abundantly on the surface of the globe. Marbles, certain building stones, chalk, calcareous alabaster, and shells, are employed in making lime. The effect of calcination is to drive off the water and the carbonic acid which are combined with the lime. The water and the first portions of carbonic acid pass off easily; but it requires an in-

* The present article is the first of a series on hydraulic and common mortars. In presenting them, the Translator thinks that he is rendering a service to the art of construction in this country.

The French, within a few years, have devoted themselves with great zeal and effect to the subject of mortars; and they have applied, with perfect success, the results of their experimental investigations, to actual constructions of great difficulty and importance. The English are, perhaps, equal to the French in knowledge of the best constituents of mortars, and in the practical composition and use of them, but they are not, like their neighbours, in the habit of recording, methodizing, and publishing their experience; and hence, though important information may be very generally spread among their builders of all classes, it is nowhere to be found concentrated in books.

In this country we have been led, within a few years, to some improvements in the practice of mortar making, by the actual necessity imposed by extensive hydraulic works, and by the providential diffusion over our territory of an admirable material; still we are, for the greater part, the slaves of an antiquated routine, elsewhere known to be radically wrong.

The works here translated are recent, and amongst the best issued from the French press: others have been carefully consulted; as Vicat's, Raucourts's, Soleirol's, &c., but these have been preferred as answering best to our need. To most American readers, they will present many new results, highly important, and of a character to be applied with great advantage to our own operations—they are, therefore, commended to the perusal of all who have an interest in the subject.

In relation to the terms employed in translation, it is proper to state that the expression *fat lime*, used for the *chaux grasses* of the French, is applied to lime nearly or quite pure, not hydraulic, and which swells much in slaking. *Poor lime*, or *meagre lime*, substituted for *chaux maigres*, means a lime which slakes reluctantly, swells but little, and is not hydraulic. *Hydraulic lime, chaux hydrauliques*, implies a lime which will harden, in a longer or shorter time, under water—this generally slakes slowly and swells but little. The French term *ciment* means, almost always, finely pounded bricks or tiles: with us, *cement* is a sort of generic term, having various significations, but generally implying, when used herein, the hydraulic constituent of mortars.

The term *Puzzalona* belongs, strictly, to a peculiar volcanic product, formerly much used in hydraulic mortars, and which is particularly referred to within; it is, however, often used to signify natural substances not volcanic, and even artificial substances, if producing effects similar to those afforded by the real puzzalona.

The English having adopted the expressive term concrete, to signify the mixture called by the French beton, the same term will be used in this translation.

tense and long continued heat to dispel the remainder of the acid. Lime, as used in constructions, contains, almost always, a considerable quantity of carbonic acid.

When the stone submitted to calcination is white marble, pure lime is obtained, provided the calcination be carried far enough. According to an analysis which I made of white marble, this substance contained, in 100 parts, as follows: lime 64, carbonic acid 33, water 3. Lime obtained by calcination possesses the following properties. It has a great avidity for water, imbibes it from the air, and has its bulk enlarged thereby. If a certain quantity of water be thrown on lime recently calcined, it heats highly, breaks in pieces with noise, and a part of the water is evaporated by the heat produced. The disengaged vapour carries off some particles of lime. Water dissolves about one four-hundredth of its weight of lime, forming what is called lime-water.* Lime is caustic and turns the syrup of violets green: its specific gravity, according to Kirwan, is 2.3, it attracts carbonic acid from the air, and finally returns to the state of carbonate of lime. To preserve it, it is necessary to keep it in very tight vessels.

Lime was formerly ranked among the alkalis, and it is only lately that the true nature of the substance became known. Davy, the English chemist, succeeded in 1807, in decomposing, by means of Volta's pile, the sulphate, and the carbonate of lime, or more properly *lime* derived from these compounds; obtaining a brilliant substance, having so strong an attraction for oxygen that it absorbs it rapidly from the air, and from water, which it decomposes. The brilliant substance obtained from lime is regarded as a metal and has received the name of Calcium. Accordingly, lime is only a metallic oxide.

It is rare that lime derived from white marble is used in the arts; that which is commonly employed, and which is derived from ordinary lime stone, almost always contains oxide of iron, and sometimes a certain quantity of sand, alumine, magnesia, oxide of manganese, &c. Some of these substances combine with the lime by calcination; and the lime thus acquires properties which it had not before, and of which I shall speak in the sequel.

If we take lime derived from white marble, or from common lime stone, and reduce it as it comes from the kiln, to a paste with water, and if we place this paste in water, or in humid earth, it will remain soft for ever. The same result will be obtained if lime be mixed with common sand and the resulting mortar be placed in similar situations.

It is a common practice to deluge lime, fresh from the kiln, with a large quantity of water, and run it into large basins, where it is allowed to remain in the condition of soft paste. Alberti says (book II., chap. XI.) he has "seen lime, in an old ditch, that had been abandoned about 500 years, as was conjectured from several manifest indications, which was still so moist, well tempered, and ripe, that not honey or the marrow of animals could be more so."

There is another kind of lime which possesses a singular property: if it be slaked as it comes from the kiln, as above, and be then placed in the state of paste, in water, or in moist earth, it will harden more or less promptly, according to the substances it contains. The same result is obtained if the lime, being mixed with sand, is made into mortar and placed in similar situations. If this lime be slaked and run into vats, as is done with common lime, it will become hard after a little time, and it will then be impossible to make use of it.

On slaking lime, fresh from the kiln, with enough water to reduce it to paste, it is found to augment considerably in bulk; this augmentation is such that one volume of quick lime will sometimes yield more than three volumes, measured in the condition of thick paste. When lime which has the property of hardening in water is slaked in the same manner, it affords a much smaller volume than common lime. Sometimes one volume of this lime, measured before slaking, will give, when slaked to thick paste, scarcely an equal bulk. For a long time those limes which had the property of hardening in water were called *meagre limes*, and those which had not this property were called *fat limes*. These denominations were affixed because the first kind increased but little in bulk when made into paste, while the other give a considerable augmentation of volume; and because fat limes formed, with the same quantity of sand, a mortar much fatter or more unctuous than meagre lime. But the designation "*meagre lime*" is altogether improper to indicate limes which enjoy the property of hardening in water, because there are limes which augment their volume very little, on being made into paste, and at the same time possess no hydraulic property. Belidor gave the name of béton to lime which had the quality of hardening in water; but many engineers continued to call it *meagre lime*. The denomination of béton is not suitable; and, in this sense, is not now in use. The following are the terms now employed.

* *One four hundredth, Davy*—one seven hundredth and fifty-eighth, *Thompson*—one seven hundredth and seventy-eighth, at 60 deg. Fahr., *Dalton*—*Tr.*

In England, the name of *aquatic lime* has been given to lime which indurates in water; in Germany it is called *lime for the water*; Mr. Vicat, engineer of roads and bridges, has proposed the name of *hydraulic lime*, and this denomination, which is a very good one, has been generally adopted. I shall therefore call that lime which swells considerably in slaking, *fat lime*, that which swells but little and does not harden in water, *meagre lime*, and that which possesses the property of hardening in water, *hydraulic lime*. *Fat lime* is often called *common lime*, also. The term *quick lime* is applied to all unslaked limes, whether *fat lime*, *meagre lime*, or *hydraulic lime*. Although *meagre lime* and *hydraulic lime* may have been calcined exactly to the proper degree, still they are slower to slake and give out less heat than *fat lime*. When *fat lime* has been too much burned, it also becomes slow to slake; while, if properly burned, it begins to slake the instant water is thrown on. Experiments, to be given in the sequel, will show that iron, in the state of red oxide, causes *fat lime* to slake sluggishly.

(To be continued.)

NOTES AND NOTICES.

Anti-Combustion.—We have now before us a piece of muslin which, on being put into the flames of a candle, or thrown into the fire, merely carbonizes, without flaming; so that any woman dressed in materials so prepared cannot be burnt by any of those accidents by which the young and the aged too often suffer the most painful deaths. The finest colours are not affected by the process. It is equally applicable to every substance, from the canvass of a ship of war to the finest lace, for the curtains of beds, the furniture of rooms, the coverings of sofas, and all there materials which often cause conflagration. It also prevents the attacks of mildew. Papers subjected to great heat only carbonize, and leave the writing or the numbers and value of bank-notes legible.—*Literary Gazette.*

Removal of the Gresham Lecturers.—One consequence of the recent fire at the Royal Exchange has been the long-desired removal of the Gresham Professors from their time-honoured nook near the south entrance, to the theatre of the City of London Schools, in Milk-street. Some of the professors continue resolved not to remove, but the Common Council have passed a resolution, which, if strictly adhered to, will soon bring the matter to a conclusion; they have directed the chamberlain to withhold his salary (100*l* per annum) from any of the learned gentlemen who shall decline to comply with the order of removal. We are sorry to perceive that the old and inconvenient time of delivery is still, from sheer necessity of course, persisted in. However, the first blow is half the battle, and, if the *worthy* professors can only be got from the vantage-ground of their old lecture-room, reasonable hopes may be entertained, that by following up the blow, the Gresham Lectures may ere long be made something more than a means of putting a few hundred pounds a-year in the pockets of sundry connections of the corporation.

The French Fire-Brigade.—The late burning of the Italian Opera House at Paris, has roused the attention of the French authorities to the expediency of providing more efficient means than at present exist, of curbing the ravages of fire. They called in to assist in their deliberations, the commander of the corps of Sapeurs-Pompiers, Colonel Paulin, the reputed inventor of the fire-proof dress, which was originally produced by our countryman Dean. The whole of his suggestions on the subject were adopted, and are forthwith to be carried into execution. It is his opinion, however, that nothing can be properly effected unless there be an immense increase in the number of the corps under his command. These Parisian firemen are like the police, a military body, and their efforts have excited high admiration from some English observers: it is only fair to observe at the same time, that the voluntary assistance of the by-standers at the great Parliament House fire of 1834, was deemed much more striking, as well as more effectual than the said exertions of the French Sapeurs; and that, too, by a countryman of their own.

Art-Union of London.—This Association has so noiselessly pursued the tenor of its way, that it will excite surprise in many, that no less than thirteen pictures, the largest of the value of 100*l*., were purchased by its funds in the course of last year from the most deserving of our native artists. The Union is composed of an unlimited number of subscribers at one guinea each, all of whom have a chance of gaining a picture as a prize, in a sort of lottery, while each is sure to receive an engraving, in first-rate style, of one of the pictures drawn. The plan seems to be going on prosperously, as is likewise the case with a similar society in Edinburgh; and others are expected to be soon established in the principal provincial towns in England and Scotland.

Chromapolygon.—We have been favoured by Mr. Mordan, the celebrated mechanist, with a view of this addition to our domestic arts. The chromapolygon, which will be early submitted to the public, consists of geometrical paper figures, which are susceptible of multiplied combinations *ad infinitum*, thus forming a realization of the innumerable and ever varied objects and colours on the kaleidoscope. As a means of portraying patterns for Manchester and other manufactures, the superior decoration of the mansion or palace, its utility will be evident. By a judicious employment of the various shades of colour the perspective of solid geometrical figures may be produced, and thus an outline of the science of solid geometry be insensibly acquired. As a source of brilliant ornament it may be applied to the decoration of albums, portfolios, fire-screens, and other tasteful or bizarre objects, suitable to the tables and boudoirs of the opulent.—*Times.*

London Fires in 1837.—Next week we shall lay before our readers, Mr. Baddeley's elaborate and interesting report on London fires, during the past year. From the length of the report we shall be compelled to give a double number.

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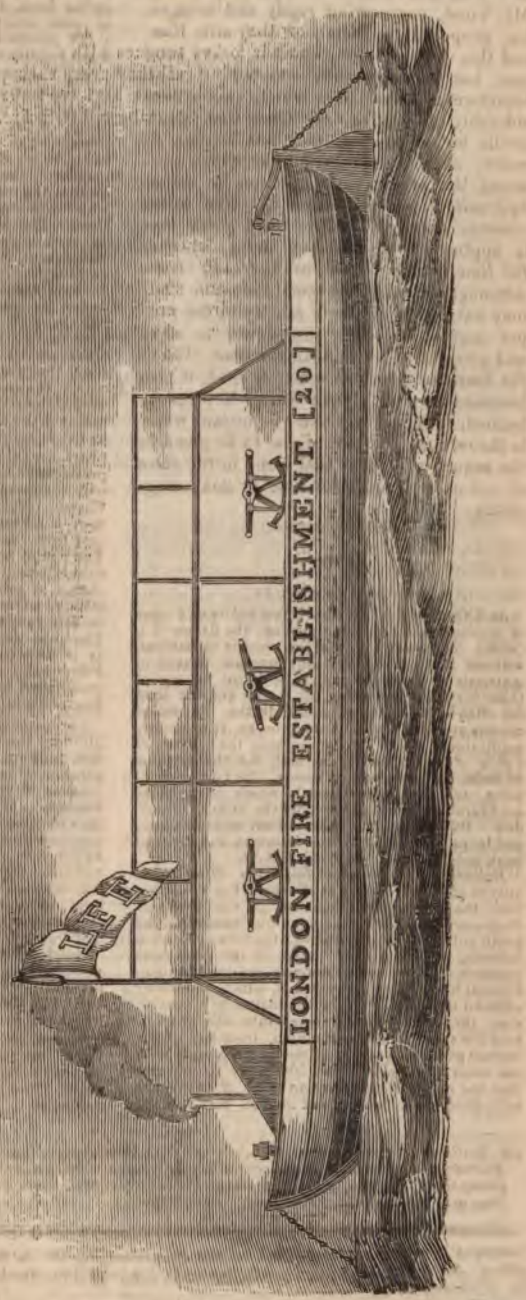
757.] SATURDAY, FEBRUARY 10, 1838. [Price 6*d.*



LONDON FIRE ESTABLISHMENTS' FLOATING FIRE-ENGINE.

LONDON FIRES IN 1837.

" See! how the fire, in fiercely curling flames,
All greedily climbs up the yielding timbers.
See! how they rise, like vex'd and hungry serpents
Darting their forked tongues with deadly strength,
As with consuming coil they grasp their prey.
Hark, how the timbers crackle! see! the walls
The whited walls all glowing red with fire.
On every side the fearful element
Rages all unopposed; * * * *
* * * * * * * *
Hark! hark! what is that indistinct wild cry,
That rises in the distance of the multitude?
And what those blazing lights that stream along
Swift sailing in the distance? The hard tramp
Of horses' feet, and whirling roar of wheels
Tell of the wondrous engine's glad approach.
The crowds divide, and with a shout of welcome
Yield a wide passage to the sturdy group.
Down spring the men; unharnessed are the horses;
Outspread the leathern hose; unlock'd the sluices;
High aim'd the well made branch; groans the strong engine
And the heavy flood's uphurled into the flames.
They pale, they shrink; and hissing quit their prey."

" *The Conflagration*," by the Author of the " *Mechanics' Saturday Night.*"

Sir,—Among the numerous calamities of life, characteristic of the uncertainty of all sublunary things, accidents from the uncontrolled influences of the elements are the most fearful. Water may perhaps assert an unrivalled preeminence in the extent of its destructive ravages on our globe; yet, water as the servant of man, in his skilful hand becomes a powerful auxiliary in subduing the more subtle, and even more destructive, element of fire.

Although the ill effects of fire may not have been experienced on so extensive a scale as those of water, yet they are more frequent in their recurrence, and often more painfully distressing in their consequences.

Of their frequency, the past volumes of your Magazine have borne ample testimony, and I have now the task of adding another annual record to the melancholy list.

I dare say many of your London readers, and all our friends in the country, will learn with some surprise that there have been no less than 717 alarms of fire in the metropolis during the year just ended. Nevertheless, such is the fact, as set forth in the following explanatory table:—

MONTHS.	Number of Fires.	Number of Fatal Fires.	Number of Lives Lost.	Alarms from Fires in Chimneys.	False Alarms.
January........	34	3	4	15	9
February.......	39	0	0	15	10
March..........	58	2	2	17	7
April..........	31	2	2	11	5
May............	48	4	4	5	4
June...........	44	1	1	4	12
July...........	47	0	0	1	5
August.........	43	0	0	12	9
September......	39	2	4	12	7
October........	41	1	1	3	13
November.......	37	1	1	15	6
December.......	40	0	0	17	2
Total......	501	16	19	127	89

mber of fires wherein the premises have been totally destroyed, is............	22
eriously damaged..	122
damaged..	357
	501
which proved to be occasioned by chimneys taking fire......................	127
larms..	89
the total number of calls...	717

ough I have here stated, that in -two instances the premises in the fire originated were wholly ned, these instances (with one ex-) were by no means those in which atest amount of damage was sus- At the following, and several ires, where the efforts of the fire- ere ultimately crowned with suc- d the fire fairly beaten, the amount al damage was far greater than in f those cases in which the premises small) were "wholly consumed", the usual methods of suppression by any possibility be brought to pon them. Among the serious es, may be classed the fires at the "White Horse" Saffron Hill, in February; at Mr. Myers' Musical Instrument Maker, in the Poultry, and at Mr, Spottiswoode's Printing-office, New-street Square, in March; Mr. Booth's Distillery, Brentford, in May; Mr. Clunes', Pawnbroker, Liquorpond-street, in June; Mr. Moate's Soap Manufactory, Gloster-terrace, Whitechapel, in July; West & Co's Granary, Upper Thames-street, in September, and several others; all of which, in their suppression, reflect great credit on the skill and perseverance of the London Fire Brigade.

The total number of buildings more or less damaged is upwards of 600.

mber of instances in which insurances had been effected on the *building and* *tents*, was..	173
building only..	47
contents only	76
insured	205
	501

foregoing list does not include a rge number of chimnies on fire, l of them attended with consider- nger,) at which the men and en- f the London fire establishment een present; the 127 mentioned in egoing table, were reported to be *res* and caused a general turn out brigade. The *false alarms* have f the usual varied character, some ting in error, others in design; on t of January, the eighteenth of ry, the sixth of October, and on th and fifteenth of November, rora borealis was visible in this and presented appearance so y resembling those attendant on a id distant conflagration, as to cause number of men and engines to it in quest of it. The periodical of these appearances in the month *ember, has excited great* interest *stronomical world,* and several *ig facts connected with this curi*ous phenomenon may be found at page 172, of your 749th number.

Of the twenty-two "*total losses*", *three* of the premises were so far distant as to preclude the possibility of timely assistance being rendered by the London firemen. The first of these fires occurred at Stratford, Essex, February 20th, and consumed the dwelling house of Mr. English, Surgeon; the further extension of the damage was, however, prevented. The next was at the Manor Steam Mills, in the Deptford Lower road, June 21; the Steam Mills were entirely destroyed, but a windmill adjoining was saved, although the flames had communicated to it. The last distant fire was at Turnham Green, September 11th, when the workshops of Mr. Whitlock, coach-maker, were consumed. Of the remaining "total losses", *seven* consisted of small buildings which had become so completely ignited before the fire was discovered, as to defy all attempts to save any portion of the premises

from destruction. In the other *twelve* instances, in addition to the thorough ignition of the buildings, their contents consisted, for the most part, of tar, oil, turpentine, and other highly inflammable substances, the combustion of which is so intense as to be altogether inextinguishable.

The supply of water has generally been good; but at Vauxhall Gardens, and in Glass-house-street, Regent-street, considerable delay was experienced in procuring a supply of this necessary element. In the Southwark district considerable improvement has taken place, since the communication with the Brixton reservoirs of the Lambeth Company, and great praise is due to Mr. H. Bell, turncock to the Southwark works, for the extraordinary alacrity he has displayed upon several recent occasions; the water being turned on simultaneously with the arrival of the engines; which has led to some very splendid stops being put on fires in this part of the town.

By far the largest conflagration of last year in the metropolis, was that at Davis's Wharf, Potter's Fields, Horsleydown, in December last: the details of this fire are too fresh in the public mind to need recapitulation here; but I may just observe, that although the flames first communicated to a large quantity of turpentine, and then to oil, and spread with great rapidity over an extensive space of ground, covered with buildings stored with the before-named and other inflammable commodities,—the fire did not extend after the arrival of the firemen and engines. Although the fuel upon which the flames were preying was such as to defy suppression, the firemen maintained the position they first took up, and preserved the adjoining buildings from the impending danger, subsequently advancing until the fire was completely vanquished.

The following list exhibits the occupation of the premises at which the foregoing fires have occurred, care having been taken to discriminate between the origin of fires in that portion of the building occupied in trade or manufacture, and those that have happened in, and damaged the dwelling parts only.

Apothecaries and dealers in drugs, not manufacturers	4
Bagnios	4
Bakers	8
Baths	1
Barge and Boat-builders	3
Beer-shops	3
Booksellers, Binders, and Stationers	4
Brokers and Clothes-salesmen	3
Builders	1
Cabinet-makers	8
Carpenters and other workers in wood	12
Cart Grease-maker	1
Chandlers	2
Cheesemongers	2
Coach-makers	4
Coffee-roaster	1
Coffee and Chop-houses	2
Colour-manufacturers	3
Cornchandlers	3
Curriers	3
Distillers	4
Do. Illicit	1
Do. of Tar	3
Docks (warehouses in)	1
Drapers, Linen and Woollen	14
Eating-houses	4
Farms	3
Feather-merchants	1
Fellmongers	2
Carried forward	105

Brought forward	105
Firework-makers	3
Floorcloth-manufacturer	1
Founders, Brass and Iron	4
Gas-works	3
Grocers and Tea-dealers	8
Hat-manufacturers	2
Hotel	1
Japanner	1
Lamp Black-maker	1
Laundresses	3
Lucifer Match-makers	10
Marine Stores (dealers in)	5
Musical Instrument-makers	3
Oil and Colourmen (not manufacturers)	16
Paper-hanger	1
Pawnbroker	1
Printers	4
Printing Ink-maker	1
Plumbers, Painters, and Glaziers	2
Private Dwelling-houses	187
Do. (Lodgings in)	34
Public place of amusement (not a Theatre)	1
Rope-maker	1
Shops and Offices	23
Ships	2
Do. Steam	2
Stables	10
Carried forward	439

Brought forward......	439	Brought forward......	459
-maker	1	Tobacco-manufacturers	2
mill	1	Unoccupied Buildings............	5
erchant..................	1	Under repair, do..................	2
l-meat, dealer in	1	Upholsterer	1
-chandlers, Melters, and Soap-rs	4	Varnish-makers	2
....	1	Victuallers, Licensed	28
....	4	Warehouses.........................	3
....	1	Wine and Spirit-merchants	2
-merchant................	1	Workhouse	1
ı, Braziers, and Smiths	5	Total..............	501
Carried forward......	459		

number of fires on each day of the week, during the past year, has been in lowing proportion :—

nday.	Tuesday.	Wednesday.	Thursday.	Friday.	Saturday.	Sunday.
70	75	79	74	66	61	76

following table shows the distribution throughout the twenty-four hours :—

First Hour.	Second Hour.	Third Hour.	Fourth Hour.	Fifth Hour.	Sixth Hour.	Seventh Hour.	Eighth Hour.	Ninth Hour.	Tenth Hour.	Eleventh Hour.	Twelfth Hour.
27	17	15	22	9	7	6	10	12	17	10	18
17	17	19	11	23	21	35	36	47	36	43	26

n the great promptitude with which ance is now given in case of fire, unity is afforded for making such ations, as in the majority of in-s, lead to the discovery of the man- which the danger has originated; ompt attendance is also the very ieck that can be put upon the dia- practice of incendiarism. The of the firemen at the early stage onflagration, not only defeats the , but in most cases detects the in-ı, of the vile miscreant, who, for rposes of fraud or the gratification of revenge, perils the lives and property of his neighbours to an unknown extent. In spite of the natural difficulties of the investigation, and the impediments too often perversely thrown in the way of inquiry, the fires of last year have been traced to the following causes, a careful perusal of which is calculated to convey a useful lesson; the more especially, as it is evident that a very moderate share of attention would suffice to reduce the annual number of accidents by fire very materially. There have been occasioned by

nts of various kinds ascertained to be for the most part unavoidable	17
l ignited on the person	7
s set fire to bed-curtains	47
s set fire to window-curtains......................................	29
s, various accidents with	49
sness, palpable instances of	7
en playing with fire	18
enness	2
sparks from	10
kindled on hearths and *other* improper places	5
rks..	5
topped up, defective, or ignited...	53
Carried up.......	249

Brought forward......	249
Fumigation, incautious	2
Furnaces, overheated, &c.	12
Gas, sundry accidents from escape of	25
Gas, accidents in lighting of	6
Gunpowder	3
Lamps	3
Linen, drying or airing before fires	41
Lucifer match-making	8
Ovens, overheated, defective, &c.	3
Shavings, loose, ignited	8
Spontaneous ignition of rags	3
Spontaneous ignition of tan	1
Stoves and stove-pipes, defective, overheated, &c.	28
Stoves, drying	8
Suspicious	7
Tobacco-smoking	3
Trades and manufactures, fire-heat applied to various purposes of, &c.	22
Wilful	5
Undiscovered	57
Total	501

There is one cause of fire upon which I cannot refrain from offering a few remarks, I allude to the prevalent practice of closing up with *timber*, fire-places communicating with flues still in use. Within the city alone many thousand pounds worth of property have been endangerered, during the past year, by this fruitful source of mischief. In these instances, the fire-place in a shop, warehouse, &c. has been wainscoated over, and glass cases, counters or cupboards fitted up against it. A stove pipe has been led into the chimney, from which, or perhaps from an adjoining chimney, a large quantity of soot has been deposited in the fire-place; at length a spark passes over, the soot takes fire, and burns, communicating to the wainscoating, and if in the night-time, probably envelopes the apartment and its contents in flames, before the mischief is discovered.

The cruel practice of locking up children of tender years in a room with fire, while those who should be their natural protectors are absent on business or pleasure for hours together, cannot be too severely reprobated; but I fear that those who are in the habit of so doing, are callous to any remark that I could make. When death results (as it too often does) from this heartless practice, a verdict of *manslaughter* ought to be *passed against* the offending party. This *might, perhaps,* inculcate a lesson which the ordinary feelings of humanity ought to teach—unaided.

The present report exhibits an unfortunate increase in the number of *fatal* fires, and also in the number of lives lost, as compared with those of preceding years. The number of persons that have perished at fires attended by the firemen of the Establishment is nineteen, but the actual number of deaths by fire is considerably greater; thirteen cases of death by burning, not included in the foregoing report, having come under my own immediate notice.

The first fatal fire occurred at three o'clock in the morning of New Year's day, at the house of Mrs. Owen, Chapel-street West, May Fair, when a young female who was in an upper sleeping-room, perished in the flames. No intelligence of the breaking out of this fire reached any of the Establishment stations till forty minutes past three o'clock. It is more than probable that had the alarm been duly given, the unfortunate deceased might have been saved, and the fire stopped before any considerable damage had been sustained; as it was, the upper floor and attics were completely destroyed, but the lower part of the building was preserved.

The next fatal fire took place on the 12th of January, at noon, in Oxford-buildings, Oxford-street, when two little children perished in a room which they had accidentally set on fire, and were

nted from escaping by the door locked upon them. By the exer- of the neighbours, and the timely l of the engines, the fire was con- to the room in which it origi-

third fatal fire was at the shop of iddle, clothes-salesman, Long-lane, Smithfield, at eight o'clock in the ng of January 18th. A naptha in the window having been over- l, this dangerous fluid instantly d and set fire to the shop. Mr. Mrs. Biddle exerted themselves to most to extinguish the flames, in which they were both severely d, and Mrs. Biddle's clothes catch- re, she sustained such serious in- s caused her death in the hospital ich she was removed.

the 26th of March, soon after ght, a fire broke out at the house . Joyce, Exeter-street, Chelsea. It irst discovered by the police-con- on duty, who sprang his rattle and n alarm. After a lapse of nearly inutes, Mr. Joyce was seen to make cape in his night-shirt along the et to a neighbour's house. For rds of half an hour no engines could ocured; at length the Hans-town e was brought to the spot, but no n being with it who understood its gement, it was quite useless. The ngton beadle soon afterwards ar- with the Brompton engine, but om its defective condition was just less as the other. At length no- f the fire having reached the Es- hment stations, their engines poured quick succession; they rapidly ar- l the progress of the flames, and rved the adjoining buildings to the fire had communicated. By o'clock the ruins had been suffi- y cooled to allow a search to com- e, when the calcined remains of Battye, a gentleman upwards of y years of age, were discovered in ack part of the premises. He was sed to have been suffocated in his s he slept, unconscious of the dan- which surrounded him, all attempts aken him having proved unavail-

Tuesday, May 9th, at two o'clock morning, a fire broke out in the of Mr. Furze, Cleveland-row, St. s, when the unfortunate occupier perished in the flames. The fire had gained a considerable head before it was discovered, and the building was in so dilapidated a state that it fell down before it was half burned; the speedy arrival of the firemen saved the adjoining buildings, but the catastrophe was at an end before they could possibly reach the spot.

The next fatal fire broke out on the 25th of May, at a quarter past six in the morning, at the Wheatsheaf public-house, in Holywell-street, Strand. The fire was first discovered by Tozer, a fireman attached to the Chandos-street station, and although the hour was so far advanced, the inmates were fast asleep, and Tozer had great difficulty in arousing them to a sense of their danger. Having broken open the street-door, and found the stairs enveloped in flames, so as to cut off all communication in that direction, Tozer returned to the street; he then procured a ladder, which proved to be too short; however, it was held up so as to reach the second floor window, from which Mr. and Mrs. Hotten descended in safety. A female domestic was rescued from another window by Mr. Ives, an ex-fireman of the Albion office, now a Thames police-officer. One unfortunate individual, Mr. Mathews, of Radford near Gloucester, who was at the time sojourning in the house, was burned to death in his bed, all attempts to wake him proving ineffectual. The "Wheatsheaf" and adjoining buildings on either side, and back into the Strand, being very old and almost entirely composed of timber, and most intimately connected, they burned with terrific fury. The very prompt arrival of the firemen and engines, from the several stations to which the alarm had been instantly forwarded by Tozer, enabled the firemen to stop the spread of the fire in gallant style. When the great height of the buildings in the Strand, and the materials of which they are composed are taken into consideration, the manner in which this fire was stopped is very remarkable, and reflects great credit upon the skilful and courageous exertions of the men.

The next fatal tragedy occurred within a few hundred yards of the preceding, on the 14th of September, when a fire broke out, about a quarter past four in the morning, in a small wooden tene-

ment occupied by Mr. Harris, dealer in India Rubber, &c., in the Strand. The fire which broke out in the shop was first discovered by a police-constable, (George Rodden), who, on being applied to by Mr. Harris for assistance, broke open the shop door, but the flames had gained such an ascendancy as to beat him back; he then sprang his rattle and ran away to Joy-bridge-lane for one of Mr. Ford's spar fire-escapes, which was there stationed. Previous to his return a chimney sweep had alarmed the firemen at the Chandos-street station, from which three engines were rapidly conveyed by hand. Immediately on reaching the spot, the fire-ladders were taken off the engines, and raised to the window at which the unfortunate inmates had appeared crying for help; but owing to the time lost before calling the firemen, added to the combustible nature and contents of the building, and the draught afforded to the fire by the opening of the door, all attempts to reach the window were unavailing; from which a dense volume of smoke and flame was pouring forth, and just within lay the mangled bodies of Mr. Harris, his daughter, and a female servant. The policeman stated on the coroner's inquest, "I fetched the fire-escape with the assistance of one man; we did not return with it until *ten minutes* had elapsed. The distance was three or four hundred yards. The wrong end was raised first, and then the right end: it took five minutes to doctor it, but right or wrong, the escape came *too late*." It is evident that poor Mr. Harris placed too much reliance upon the proximity of this *fire-escape* to his dwelling (his cries were "fire," and "*fire-escape*") or, being a man of great personal activity, he would have made some effort for the preservation of himself and family. Had the policeman in the first instance gone to Chandos-street station for *proper assistance*, there is little doubt no loss of life would have ensued; the few moments lost in giving the alarm there, being all that was wanted to effect the rescue of Mr. Harris and his fellow-sufferers.

The parish officers of St. Martin's in the Fields, in their usual illiberal manner, *refused to pay the* customary rewards *to the firemen* for their early attendance *at this fire*; although they were on the *spot as soon as* they possibly could be, and the early stopping of the fire was such, as to reflect the highest credit upon their exertion.* The firemen were subsequently offered a paltry pittance, but the churchwardens having chosen to trust in "the glorious uncertainty of the law" for support in the fraudulent interpretation they had put upon the act of parliament, the firemen referred the matter to the proper tribunal, and Sir F. Pollock has during the present term obtained a rule to shew cause why a *mandamus* should not issue, to compel Alderman Winchester, a resident magistrate, to issue a distress warrant against the churchwardens for the amount of the firemen's claim. But more of this anon.

Of the remaining fatal fires, *five* originated in the dress of adult females taking fire and causing death; *four* arose from similar accidents with children.

It would be exceedingly unjust to conclude this subject without noticing the gallant conduct of Goddard, a fireman of the London Establishment, who effected the rescue of two children under circumstances of peculiar danger. About an hour before noon on the fifth of August, a fire broke out in the house of Mr. Mansfield, tinman, Bermondsey-street: on its first discovery great efforts were made to extinguish it, but Mr. Mansfield, finding the flames gaining ground, ran to the Morgan's-lane station for assistance. The engine was instantly horsed and speedily reached the scene of danger; on its arrival, Goddard proceeded up strairs to ascertain the situation and extent of the fire. On reaching the door of a room that was filled with fire and smoke, he heard the stifled cries of a child; regardless of all personal danger, he dashed into the room, and directed by the voice, he groped his way until he found two little children on a bed that was burning; having secured his precious prizes, he made an effort to gain the door which he reached completely exhausted. Having been conveyed by his comrades into the open air he soon recovered himself. He had to pass and repass the flames, and the smoke was of the most suffocating description; in a few seconds more, the children would have been past all human succour. Had the fact of their being in

* It is right to state, that neither the Parish Fire-escape nor Parish-engines were forthcoming upon this occasion; the latter, if not the former also, being out of repair and useless!

the room been known, their extrication in the infancy of the fire would have been comparatively easy, but of this no one appeared to be conscious.

The success of the firemen, upon the whole, during the past year, has been of a very extraordinary character, and reflects infinite credit upon the *men*, as well as upon the *master-mind* who guides them. Of last year's fires, no less than two hundred and thirty-nine, including several of the largest, were wholly unattended by any firemen or engines save those of the Insurance Companies, and but for their skilful and meritorious exertions, it is difficult to say what might have been the consequences to this metropolis. In the early part of the year, Mr. Braidwood, the talented superintendent of the London Fire Establishment, received a cheque for twenty guineas, from the Governors of the Bank of England, with a request that the amount might be distributed among those firemen who were engaged in extinguishing the fire which broke out on the night of November the 1st, 1836, in the new buildings situated in the north-west angle of the Bank. The fire, it may be remembered, was of a serious description, and had broken out in one of a suite of rooms in which some curious and ingenious machinery was being erected for the printing of bank notes by a new and improved process. By the regulations of the London Fire Establishment, the men are strictly forbidden from receiving and fee or reward, unless previously sanctioned by the committee of managers; their consent having been obtained, the money was equally divided among the seventeen men, belonging to Watling-street, and Jeffery-square stations, who were employed at the fire. This liberality of the Bank of England, and a similar bounty given by —— Maitland, Esq. for assistance rendered at the destruction of his mansion. (Loughton Hall, Essex,) by fire, contrast strangely with the conduct of Government, which has never given a single penny of gratuity for the arduous and valuable services rendered by the men and engines of the London Fire Establishment on the occasion of the conflagration of the *two Houses* of Parliament, *nor for their subsequent important services when the General Penitentiary, Millbank, was on fire.* A positive promise was given at the time, that the firemen should be rewarded for their bravery and good conduct, at the burning of the Parliament House, but it has never been performed. Although upwards of sixty of the men were engaged for many days in digging up and clearing the ruins, not so much as the empty compliment of a verbal or written acknowledgment of thanks for the services rendered, was given. The Insurance Companies from the first, disclaimed receiving for themselves any compensation for the assistance given, and the expenses incurred in the purchase of extra tools for digging the ruins; but it was generally expected the men would would receive a suitable reward for their long and laborious employment.

It will be remembered that several of the firemen were seriously hurt at this fire, and a petition on behalf of one of them, John Hamilton, who by the falling of part of the Speaker's house, sustained a compound fracture of a leg and was greatly bruised about the body, was rejected by the Commissioners of Woods and Forests on the ground that, *as his pay was continued to him by the fire establishmant while he was lying a cripple in the hospital,* he had no claim to pecuniary compensation. Some months afterwards, as if ashamed of their ungenerous conduct they sent him a paltry present of ten pounds!

During the past year the London Fire Establishment have increased their force by the addition of a new floating-engine of great power, a representation of which accompanies this communication. It consists of a fine barge, fifty-four feet long, by sixteen feet wide, and two feet five inches deep, in which are placed three engines, each having two working barrels seven inches in diameter and a globular air-vessel. The levers are pierced in three places so as to give an eight, ten, or twelve inch stroke to the pistons at pleasure. The handles range cross-ways of the boat, and when in ordinary are folded up, but open out to eighteen feet in length. All three of the engines work into one common main, four inches in diameter, from which any one or more can be shut off at pleasure; so that the derangement of one engine (should such occur) will not interfere with the action of the others. Three elbows, one opposite to each en-

gine, rise through the deck, and when out of use are closed by screw caps; to any one, or all of these elbows, leather hose can be attached, and an immense volume of water thrown in one heavy jet, or divided into two, three, or more streams as occasion may require. The suction mains have a five-inch waterway; that of the delivery hose is three inches and a half. The hose is kept joined and coiled upon a reel (from which any required length can be quickly run out) in the stern of the boat. There are three long and as many short branch-pipes on board, with eight spare nose-pipes of various bores, ranging from one inch and a half to five-eighths of an inch diameter. With the regular complement of ninety men and a one-and-a-quarter inch nose pipe, three tuns of water are delivered per minute, the jet rising upwards of one hundred feet. More fully manned and with an inch-and-a-half nose-pipe, four tuns may be projected in the same time. The barge was built at the celebrated yard of Messrs. Searle and Son, Lambeth; the engines were constructed by Mr. Tilley, Engineer, Blackfriars-road, and both parties appear to have executed their respective portions of the work in a very substantial and workmanlike manner. This valuable machine is usually moored just above the Southwark Bridge, with one fireman constantly on board who is relieved every twelve hours. Notice has been very extensively given to the watermen generally, that in case of water-side fires a very liberal reward will be given to those men who are first on board and assist in unmooring the barge; those who work the engines at a fire receive two-shillings for the first two hours and six-pence an hour afterwards. Watermen are paid three-pence each for every able-bodied man they put on board. On receiving an alarm of fire in the daytime, the fireman in charge hoists a red flag, and sounds a gong until the requisite number of hands are on board; if it is in the night, a large lamp with eight red reflectors, is hoisted in lieu of the flag. On starting, two feet deep of the sides (on which the lettering is placed) falls down, and presents eight row-locks on each side for eight pair of oars, which are sufficient to propel the boat at the rate of from two to six miles an hour, according to the strength and direction of the tide. There are two long sweeps for assisting in the navigation; the steering being effected by a rudder. This powerful engine was first brought into actual service on the 19th of September last, at a fire which broke out in the granary of Mr. West and Co., on Pearson's Wharf, Upper Thames-street, and although worked under disadvantageous circumstances, its great power and value in case of water-side fires were clearly demonstrated. At the time this fire broke out, it was unfortunately nearly low water and the tide still running down strong, and although the boat when manned draws but eighteen inches water it was impossible to get it nearer than within four hundred feet of the burning building. This length of hose was however soon got out, and a jet poured into and upon the building with amazing effect. In fact, such was the fury with which the water battered against the walls and coping of the building, that bricks and stones were displaced by it. This engine again came into efficient operation at Davis's Wharf on the 28th December. Tide running down at the time, this engine soon reached the fire, and was quickly followed by the old floating-engine from its station at Rotherhithe. The floating-engines belonging to the London, and the St. Katharine's Dock Companies, were subsequently brought up, and it has been attributed to the immense volumes of water poured in by the united powers of these engines, that this fire was so happily arrested in its progress; the supply of water being for a long time quite unequal to the full working of the numerous land engines got in readiness.

It would be fulsome to enlarge any further upon the good conduct of the firemen generally, and were I to enumerate the several instances of individual bravery and skill which I have witnessed, I should far exceed the proper limits of this paper. In repeating an expression which the newspapers have upon several occasions made use of, describing the conduct of the firemen as "*above all praise*," I say of the whole, what is strictly true of each. It gives me much pleasure to be able to state that no serious accident has occurred to any of the firemen during the past year; several "hair breadth 'scapes" with sundry bumps and bruises have been encountered, the latter rather plentifully, but no loss of life or limb

has to be recorded. The bold daring of Mr. Braidwood, stimulates his men to continual acts of heroism, while from his watchful anxiety for their safety, they feel well-assured that they are ably supported and a retreat if necessary secured to them.

All that the firemen ask, is *timely notice*, and the result may then be safely left in their hands; bearing in mind that man is the creature of accident and frequently surrounded by circumstances over which he can exercise no controul, that confine his powers of action to very narrow limits.

From the extraordinary increase of fires, both in number and extent, at home and abroad, since the period at which this report properly concludes; the propriety of guarding against accidents of this kind with more than usual vigilance is strongly suggested. Those who are wise will provide against the ruinous effects of a sudden conflagration, by availing themselves of the invaluable benefits of *insurance;* and I cannot help expressing my sincere regret, that the legislature should to this hour continue to inflict a duty on fire-insurance. This *tax upon prudence* calls loudly for repeal, and I cannot help thinking that it reflects infinite disgrace on the government who can make the misfortunes and calamities of its people an important source of its revenue.

With the sincerest wishes for the prosperity and permanent success of Mr. Braidwood and his courageous companions,

I remain, Sir,
Very respectfully your's,
WM. BADDELEY.

Wellington-street, Blackfriars Road,
Jan. 25, 1838.

WHITWORTH'S PATENT CASE-HARDENED SCREW-STOCK.

Sir,—Every successful attempt to improve a tool in such constant and general use as the screw-stock, is deserving of commendation, and I have now the pleasure of bringing before your readers what to me appears the greatest improvement ever introduced in this important apparatus. I allude to the Patent Case-hardened Screw-stock of Messrs. Whitworth and Co., Rutland-street, Manchester; in which three dies are employed and are all brought up simultaneously by the action of a single screw.

In the accompanying diagram, *a* represents the frame of the stock: *b b b*, are three dies or cutters. Within the box of the stock, a circular piece of metal revolves, having three inclined planes on its inner edge, *c c c*, which being turned, urges the dies forward continually; motion being communicated by a micrometer screw *d*. Three metal projections on the stock-frame *e e e*, serve as guides to the dies, keeping them always in their respective places. From an inspection of this rude sketch, it must be evident that in the following respects the patent is superior to all other screw-stocks hitherto produced. In the first place, the dies being formed of a piece of the best cast-steel in its simplest form, it can be hammered dense so as to carry an edge to the utmost limit that steel is capable of. Secondly, the dies can at all times be sharpened on a grindstone, and kept in as good condition as any other edge-tool. Thirdly, screws are cut more steadily, and with much greater truth, by three dies than with two. Finally, the cutting argle is so favourably situated, that square threads can be cut with the same facility as angular, or round ones. The Patent screw-stocks are made in a regular gradation of sizes, so as to suit all purposes, and Messrs. Whitworth and Co. have adopted a standard of screws,

without fractional parts to the inch (except in the case of some of the coarser square threads); their round threads usually range from four to twenty-four, and the square threads from two and a quarter, to eleven threads in the inch.

The care and attention which the Patentees have bestowed on the getting up of these articles, reflect much credit on their mechanical skill, and the result of their labour is a tool which every well-informed workman will duly appreciate.

The ingenious principle of revolving planes which Messrs. Whitworth and Co. have employed in this instance with such good effect, may be applied in a variety of different ways with similar advantage; as a universal chuck for centering either large or small articles in the lathe, it is surpassed by nothing at present in use, and may be made with great facility.

I remain, Sir,

Your's respectfully,

WM. BADDELEY.

London, Feb. 1, 1838.

AIR-BLAST TELEGRAPH.

SIR,—As all the world seems invention-mad, allow me to add to the "gathering." But permit me to premise that I am of opinion, that nothing will equal the electric telegraph if it can be brought to perfection. Yet, when I see hydraulic telegraphs suggested, I cannot but venture to recommend my whim also. Suppose a number of parallel pipes laid down with light caps or stopples at each end; and that these caps were adapted to spring up and register any number or letter attached to them by a means which might easily be contrived, would an air-blast-engine applied at one end have the effect of elevating the caps at the other? If this could be done it seems to me a simple and by no means costly method of communicating signals and preferable to the hydraulic telegraph, where among other disadvantages the water might find vent and suddenly disappear.

Your's most respectfully,

G. K. H.

CHAPLIN'S PATENT PROCESS OF TANNING.

SIR,—I have read with much pleasure, in No. 755 of your exceedingly valuable publication, "A Tanner's" observations, upon statements contained in a circular, which endeavours to exhibit the advantages derivable from the use of Mr. Chaplin's patented method of tanning. Most cordially do I agree with him in the views he takes of tanning as a chemical process; and entirely concur in his remark, that the attention of improvers has not been sufficiently directed to the abridgment of the manual operations of the trade. His recommendation to endeavour to curtail manual labour without (expensive?) machinery, is, indeed, worthy the deepest consideration of tanners. Sir, I should feel most happy to reckon amongst the very limited number of my practical tanning friends, the name of one who takes so clear and common sense a view of things as does "A Tanner;" and hope I shall not long be debarred that pleasure.

The production of weighing leather, of good quality, by cheap and expeditious means, upon a simple, and easily workable system, without departure from the present mode of progressive application of liquor, is certainly a desideratum, both to the manufacturer and the consumer; more especially if it be unattended with waste, either of hide or of leather, and applicable to hides of different thicknesses and growth, whether dry, raw, salted, holed, or ill-flayed, and I have never been able to divest myself of the belief, that it will sooner or later be accomplished.

I have forwarded herewith, and will trouble you to allow it to remain at the office of your Magazine for inspection, a sample, or specimen of sole leather, cut promiscuously from one of an experimental lot of 100 butts, tanned by me upon a system which, I think, may be said without presumption, to possess the desiderata before mentioned; and I shall feel obliged, if my unknown friend, "A Tanner," would examine, test, and give me his opinion of it, either by a private communication, or by the insertion of his ideas respecting it, in your next number.

I am, Sir,

Your's very respectfully,

JAMES F. COX.

Ivy Cottage, Long Ashton, near Bristol, Feb. 1st, 1838.

CHAPLIN'S PATENT PROCESS OF TANNING.

Sir,—I have just seen in your Magazine of the 27th of January, a letter signed "A Tanner," professing to give a description of the new process of tanning, for which I have obtained a patent. I am surprised that your correspondent should have volunteered to enlighten the public without first obtaining correct information himself. If he had taken the trouble to read my specification, he would have seen that I neither "sew *two* hides together" "into a bag," nor "suspend them" in order to their being tanned. As these two operations constitute the whole of the process he describes, in his objections to which I entirely concur, and as neither of them is ever performed when leather is tanned according to my plan, I think I need not trouble you with any observations upon them. If you will have the kindness to make room for the short description of my process which I append to this letter, a copy of which I have been in the habit of giving to any one who wished for information on the subject, it will be quite sufficient.

I never asserted that tanning was "a mere mechanical filling of the pores with tan;" on the contrary, I well know, that it is purely a chemical process. What I said was, that no chemical means were employed by me, to "*facilitate* or *quicken*" the combination of the tan with the skin, and that the *unusual* means employed were purely mechanical. The *unusual* means, for which I have obtained a patent, consist in bringing the two substances into contact more quickly than usual, and this is effected by *mechanical* not *chemical* power. I differ from your correspondent in thinking that any stimulants are desirable to "quicken the combination," because I believe that the affinity between gelatine and tannin, (not "tannic acid") is quite as powerful as most chemical affinities, and that the two substances unite instantly, when they are once brought into contact. It is the difficulty of bringing them into contact, that has always occasioned the delay in tanning, and it is simply in overcoming this difficulty, without injury to the leather, and without additional *expence, that the merit of my invention consists, so* far as *advantage in the process is* concerned. In short, it is doing in a manner cheap and feasible, and therefore in a manner adapted for practical utility, what has been before effected by means too costly for anything more than experiment.

My excellent friend, Mr. Brewin, will, no doubt, be amused at the alacrity with which his neighbour comes to the defence of his patent;—needless alacrity, in my opinion, for I have always thought Mr. Brewin as capable of protecting his own rights, as he is incapable of invading those of others. But I must complain of a very injurious charge against myself. I am accused of infringing Mr. Brewin's patent, and encouraging others to infringe it. To infringe the patent right of another, is a transaction of precisely the same character as to rob him of any other part of his property. If "A Tanner" should do me the honour to look into my yard, and see there a quantity of raw hides, I do not, in the least, suppose that he would at once proclaim to the world that they were stolen: he would probably do me the justice to believe, they had been honestly bought and paid for. Why will he not do me the same justice, when he sees me using what he conceives to be Mr. Brewin's invention? But on this point, I give him no information whatever. I only prefer this mode of dealing with his remarks, to any other which might involve a discussion as to the merits or validity of Mr. Brewin's patent. It is enough for me to state that the use of terra japonica by me, or by any other person who may be authorized to use my invention, will never meet with any interruption from him. It would be well if others would imitate him in the fair and honourable spirit in which he engages in the competitions of trade; trusting to his own manly and intelligent energies, and not to unwarranted statements with regard to others.

As to the saving of labour in tanning, I confess I am not so sanguine as your correspondent. At all events, when it is considered that the cost of labour is less than one penny per lb. on the leather, while the cost of material, exclusive of the raw hide, is, in the old process, at the very least fourpence, it is obvious in which there is the most room for economy. In my process the cost of labour is something less than in the old one, but the difference is not, and, I

think, never can be, very material. I use no machinery whatever, in the common acceptation of the word: a copper jet with a spout to it, and a needle and thread, are all the *unusual* machines I require.

The statement of your correspondent, that he has "received a circular, in common with most of the members of the tanning trade," induces me to remark, that the tanners have certainly not been intruded on with any such circular by me. The circular in question is addressed to the *buyers* and *consumers* of leather only. I have no expectation that my plan will be generally sought after by "the trade." I think the history of new inventions, in this and other countries, shows that important changes in manufactures, have generally been accompanied by changes of men: that the persons before engaged in any branch of trade have not been those who have carried it on under a new system. And if past experience and past history did not induce such a belief, I could hardly think otherwise in this case, from the very decided opinion which most of the tanners pronounce against my invention. I have the pleasure of knowing some, who show the most zealous perseverance in weekly exhortations to my customers, to avoid using the patent leather, assuring them that "*the tan will all wash out again*," as soon as the leather is wetted. (By the bye, do *they* think tanning a chemical combination, or a mere "mechanical filling of the pores?") The opinion of the London bootmakers is most decidedly opposed and contradicted by that of the tanners. I may be prejudiced, but, somehow or other, I cannot help attaching more weight to the opinion of the bootmakers, who have tried it, than to the opinion of the tanners, who have not tried it—to fact and experience, rather than to theory. That the tanners should be prejudiced, Mr. Editor, is an idea too monstrous to be entertained for a moment!

I am afraid of asking for too much of your valuable space, but am anxious to make one remark as to the *weight* of leather. I, by no means, presume, or wish, to differ from your correspondent *as to the weight of* mine; on the contrary, I request the particular attention of such of your readers as may be *buyers of leather*, to the opinion he has expressed concerning it; but I would ask any sensible person this question: Suppose a new material should be produced for shoes, which had every property required, but weighed only one-sixth, or one-tenth part, of what leather weighs; would this, owing to the circumstance that leather is now sold by weight, be a bar to its use? I think not. I have no doubt that, when its good qualities were once ascertained, means would be found of assessing its value. Mere usages and customs, in buying and selling, will not often be found, in the long run, to prevail against a really useful improvement.

I convert as much skin into leather for fourpence, as will cost sixpence in the old way, and I do it in fourteen days, instead of eight or twelve months. "A Tanner" is unable to see the importance of time, but I apprehend he is nearly alone in the difficulty, and there I beg to leave him.

If any of your readers, Mr. Editor, should feel any curiosity to try the patent sole leather, I shall be happy to refer them to bootmakers in every part of London, who are regularly using it, and who may be depended on to supply it genuine. The best way to try it is to have it on one foot only, having the other shod with the best Bermondsey leather.

Your obedient servant,

FRED. CHAPLIN.

Bishops' Stortford, Feb. 3, 1838.

Description of Chaplin's patent process of tanning.—The process of tanning consists in the combination of gelatine and tannin, which have a strong chemical affinity for each other, and consequently unite when brought into contact. The hide is chiefly gelatine, and is converted into leather by means of any liquor which contains plenty of tannin. The slowness of the process arises from the difficulty of bringing the tannin contained in the liquor into contact with the gelatine in the middle of a thick hide: the outer surfaces are very speedily tanned, but this renders it still more difficult for the liquor to penetrate to the interior; and many months will have elapsed, before it has completely reached every part. By the new process the hide is made into a bag, by sewing the edges together, and then

with the liquor, so that the pres- of the fluid, its own effort to es- forces it through the pores of the ; and, as it passes, the tannin is d on by the gelatine, and the liquor s out on the other side, having left annin behind it. In this way, the est hide will be perfectly tanned in t fourteen days, while it would re- as many months on the old sys-

ere have been many previous at- ts to tan by means of pressure, but have all proceeded on the suppo- that very great and powerful ex- ous pressure was required, and ts have been taken out for the means oducing it. Some have used a carried up to a considerable height, filled with liquor, inserted in the ; others have placed the hides in isted receivers, by way of getting f the atmospheric pressure on the de: and all have *suspended* the when filled with liquor, so that sustained the whole weight of it, ldition to the pressure otherwise iced. Every one of these plans entirely failed; because, although nning was accomplished, the hides rendered completely useless, from training and distortion occasioned e immense pressure. And in ad- to this, the apparatus required for hide, was found to be too costly practical purposes. Mr. Chaplin vered, that the mere pressure of the r employed to tan with, was suffi- to produce the desired effect, with- ny extraneous force whatever, and ut even suspending the hides. He y fills them with liquor, and suffers to lie on the floor, the hides sus- g only its *pressure* or effort to e. In this way they are tanned as ily as can be wished, without in east straining or injuring the lea- on the contrary, it appears that light extension is decidedly bene-

PATTERN AND INVENTION WELVEMONTHS' PATENT BILL.

. Mackinnon, in evident despair, *e apathy evinced by the legisla- pon the subject of* an amended *Law, has for the* present abandoned even the attempt to force the subject upon the consideration of parliament. In order, however, that one injured and unprotected class of inventors may not hang as a mill-stone about the neck of another, he has thrown aside the fourteen years' patent question, and is now struggling for a twelvemonths' copyright for pattern designers. In so doing he is following out the suggestions of the Commons' Committee on the Arts and Principles of Design, whose report, and the evidence on which it was founded, we published in our twenty-fourth and twenty-sixth volumes.

At the commencement of the present session, Mr. Mackinnon gave notice that he would again bring in the bill referred to, which was so quietly bowed out of the House, with excuses and procrastinations, in the last parliament. That bill contained towards the end several clauses relative to the granting of licenses for a year to designers of patterns, and of other contrivances, who should register a fac-simile or specimen of the same in an office to be established for that purpose, upon payment of ten pounds. (Vide vol. xxvi. pp. 462, 3.) Seeing no greater chance, however, of success attending his endeavours to effect an alteration (for his bill would have been little more than an alteration) in the old Patent Law, Mr. Mackinnon subsequently gave notice that he would separate from it that part relating to licences for a year, and bring it forward as a distinct proposition. This he has accordingly done, and so far as regards the division of the question, we consider the proceeding judicious. On Wednesday last his "Bill for the better Encouragement of the Arts and Manufactures, and securing to individuals the benefit of their inventions for a limited time," was to have been read a second time, but was deferred, for no stated reason, to Wednesday the 21st instant. From this we fear a recurrence of the postponements of last year, if not the ultimate fate of the former bill.

As the clauses of this Bill are nearly the same as sections 16 to 23 of the Bill of last session, an abstract of which we published at the time, and have before referred to, we do not think it necessary to give more than a sketch of the more important of its provisions, appending a brief remark or two as we

proceed, and promising to return to the subject should occasion require.

The first clause repeals several Acts of 27th, 29th, and 34th of George the Third, relating to the copyright of patterns of printed linens, cottons, &c.

The second clause then enacts,—

"That any person who shall hereafter invent, design or contrive, or shall become the proprietor of any invention, design or contrivance, whereby, in the opinion of such inventor, designer, contriver or proprietor, some new and beneficial operation or result shall be obtained in any art, science, manufacture or calling whatsoever, may and shall hereafter have the sole right and property in every such new invention, design or contrivance, for and during the term of *twelve* calendar months from the time of registering the same, in manner and under the regulations herein in that behalf mentioned."

It will be perceived from the wording of this clause, that the present bill is intended to have a far more comprehensive operation than the mere securing of the copyright of patterns or designs for a twelvemonth. The expression, "invention, design, or contrivance," includes everything that is at present patentable, as well as the patterns and designs which are without the pale of the existing law. It takes in every creative effort of the human mind, from the shape of a mantel-piece ornament or the pattern upon a yard of calico, to the mighty steam-engine or more complex lace machinery! Although the enactments however are nominally thus comprehensive, their operation will be limited, in fact, to objects of merely ephemeral value. No one can be expected to give to the community his right to an invention which it has perhaps cost him much time, labour, and expense to perfect, for the mere price of a twelvemonths' monopoly, when, in all probability, it would take two or three twelvemonths to convince an incredulous, or perhaps only reasonably cautious, public of its practicability or utility. By a subsequent clause it is proposed to be enacted that the subject-matter of a twelvemonths licence, cannot afterwards be that of Letters Patent, nor will any renewal of the license be granted. Thus, *therefore*, the operation of the Bill will *be confined to* designs of gold and *silver plate, or*-molu work, vases, *stoves, fenders*, patterns of china and earthenware, or fancy designs for silk, lace, shawls, carpets, ribbons, paper hangings, and articles of a similar character. These are justly entitled to the protection here given them, and are of sufficient importance to merit a distinct Act of the Legislature; we therefore deprecate the wording of the clause which thus leaves the operation of the proposed law undefined.

If, instead of debarring the subject of a license from a subsequent right to a patent for fourteen years, it had been expressly provided that except in the cases of patterns and designs above referred to, an inventor might obtain a patent within the twelve months, then the bill would have been hailed by inventors as a most valuable boon. Amongst the many suggestions we from time to time receive upon the subject of the patent law, one of the most frequent is, that an inventor on registering a description, or model of an invention, might have his right of priority thereby secured for a limited time, in order that he might pursue his experiments in safety; or should he be without the means of carrying his designs into operation, have an opportunity of securing the assistance of a capitalist, undisturbed by the fear of having the product of his brain appropriated by an unscrupulous partner.

We earnestly recommend to the consideration of Mr. Mackinnon the propriety of altering the bill in this respect, and then the hardship of the present state of the law would be much ameliorated. The legislature might then take time to enter into an investigation of the subject in committee or otherwise, the result of which, if impartially carried on, we are satisfied would lead to a speedy amendment of the monstrous anomalies which now disgrace the statute-book and practice of the country in this particular.

Brief as the bill is, and temporary as are its powers, it is clogged with the venerable paraphernalia of commissions, seals, declarations, oaths, and (of course) fees and salaries. The Board of Commissioners is to consist of *one* chief and *two* subordinates, "fit and proper persons," with an unlimited array of "secretaries, registrars, clerks, messengers and other officers to be from time to time appointed by the said commis-

." The commissioners are to ffice "during their good beha- only; by which we presume is so long as they render themselves ble to the powers that be; for gh in a subsequent clause it is ed to be enacted that if any com- ner or other officer shall accept s here politely termed a "fee or y," but what vulgar folks call a he shall pay a penalty of 500*l.*, dismissed, the Bill says no- f those who are to be the judges ial mis-" behaviour." *Quis cus- psos custodes?* Who is to look e Great Irresponsible, "the chief commissioners?"

thing proposed to be enacted in to the duties of the commissioners inly highly important, and the of the bill deserve credit for the It is stated that the commis- are to hold office "so long [only], shall *personally* give their atten- upon their respective duties." m here for the beatitudes of sine- and non-residence. No work is a new "invention" in state sions, the practical application of is reserved for the "commis- for inventions" about to be And yet backed as the *three* be) with "secretaries, assistant ies, registrars, deputy registrars, messengers, and other officers," to us that the chief of "their ive [and respectable] duties" will ag the *ten* pounds which every tor, designer, contriver, or pro- ' must pay for the said commis- licence.

stipulated also, that the commis- "shall conduct themselves y, and faithfully in the due exe- of their duties." Had the phrase ently" be inserted, perhaps the would have been none the worse. and fidelity, excellent virtues as questionably are, and moreover, prominently exemplified as they e by public functionaries, are not qualifications required in officers, ould this bill become law, will in neasure have an important class ntions under their irresponsible

salaries of the commissioners are *cified in the bill, but* there is a *most portentous* dimensions, capable of containing a good round sum, and such most assuredly will the salaries amount to. This is an "invention" which those who legislate on the inven- tions of others require no prompting to bring to perfection.

ON HYDRAULIC AND COMMON MORTARS. BY GENERAL TREUSSART, INSPECTEUR DU GENIE.

[Translated from the French by J. G. Totten, Lt. Col. of Eng. and Brevet Col. United States Army for the *Franklin Journal.*]

ART. 1.—*On the present state of our knowledge of Lime.* (*Continued from page 302.*)

Some of the ablest chemists have, at different times, sought to detect the substances which impart to lime the property of indurating under water.

Bergman, a Swedish chemist, was, I think, the first who gave an analysis of a hydraulic lime-stone. That from Léna in Sweden, he found to contain, in 100 parts, the following substances; lime 90; oxide of manganese, 6; clay, 4. Bergman seems to have attributed the peculiar property of hydraulic lime, to the oxide of manganese; and this opinion prevailed for a long time. On the other hand we find in the *Bibliothèque Britannique* of 1776, vol. 3, page 202, that Smeaton, the English Engineer, who built the Eddystone Light-house, in 1757, attributed this property to clay; for he says that it is a curious question, which he leaves to chemists and philosophers to decide, why the presence of clay in the tissue of a calcareous stone should give it the property of hardening in water, while clay added to common lime produces no such effects.

Guyton de Morveau, announced in a memoir published in the year 9, that he had detected the presence of oxide of manganese in all the lime stones which afforded hydraulic limes; he announced, further, that in calcining together 90 parts of common lime stone pulverized, 4 parts of clay, and 6 parts of black oxide of manganese, an excellent artificial *meagre lime* would be obtained. It was stated above, that at that time the name *meagre lime* was given to lime that would set under water; the French chemist was the first therefore to make artificial hydraulic lime; but he, as well as Bergman, was mistaken in supposing that the presence of the oxide of manganese was necessary to the result. He would have obtained his result by burning the pulverized lime stone with clay alone.

Mr. Saussure, in his *Voyage des Alpes*, says that the property possessed by certain

limes of hardening in water is due solely to silex and alumine (that is to say, to clay) combined in certain proportions.

Mr. Vitalis, chemist of Rouen, made, in 1807, the analysis of the lime stones of Senonches and St. Catherines, near Rouen; the analysis is contained in the memoir on the schists of Cherbourg (page 58) published in 1807, by Mr. Gratien, Sen., engineer of roads and bridges. This lime stone contains, according to Mr. Vitalis, in 100 parts, the following substances; water 12; carbonate of lime 68; alumine 12; sand 6; oxide of iron 2. In addressing these results to Mr. Gratien, senior, Mr. Vitalis expresses himself thus: "It follows from the analysis that the lime-stones of Senonches and St. Catherines, are two calcareous marles, in which the chalk predominates it is true, but wherein the clay performs an important part. It is this portion of clay which, in my opinion, makes the lime of these two lime-stones *meagre*; whence it follows that the presence of oxide of manganese is not indispensable to the constitution of such limes, since the analysis proves that the lime-stone in question contains no oxide of manganese, as it would, if present, have coloured the glass violet." I noticed above that these hydraulic limes were then called *meagre limes*. We see that the analysis of these stones confirms the opinion of Mr. Saussure, who had attributed to the clay alone the property of hardening in water. Thompson, an English chemist, was of the same opinion.

Mr. Descotils, engineer of mines, also made an analysis of the lime-stone of Senonches; which analysis may be found in the *Journal des Mines* of 1813, page 308. According to this trial, the Senonches lime-stone contains a quarter part of silex, disseminated in very fine particles, and only so small a quantity of iron and alumine, that these substances can have no influence on the lime; whence this engineer concludes that the hydraulic property of this lime-stone is owing to the silex. We have, however, seen above, that, according to Mr. Vitalis, it contains twice as much alumine as silex. Mr. Berthier also inserted in the *Journal des Mines* an analysis of the Senonches lime-stone, which will be given further on, and according to which the stone contains very little alumine. This contradiction has not yet been explained. Perhaps the quarries at that place afford stones of different kinds. If so, it would be important to ascertain what is the composition of *the best*.

The analysis of the Senonches lime-stone *afforded Mr.* Descotils occasion to make an *important* remark on the silex contained in lime-stone: namely, that the silex found in these stones does not dissolve in acids before calcination, but does dissolve after calcination. This fact proves that the properties of silex are changed by calcination with lime, and that it combines in the dry way with this substance.

Mr. Vicat, engineer of roads and bridges, published, 1818, a very important memoir on hydraulic mortars. This engineer set out with the opinion generally admitted at that time, that it was the clay which gave to lime the singular property of hardening in water. He, in consequence, took fat lime, which he mixed with various proportions of clay, according to the following process, extracted from page 7. "The operation we are about to describe (says Mr. Vicat) is a true synthesis, reuniting in an intimate manner, by the action of fire, the essential principles which are separated from hydraulic lime, by analysis. It consists in allowing the lime, which is to be improved, to fall spontaneously to powder in a dry covered place: afterwards to mix it, by the help of a little water, with a certain quantity of gray or brown clay, or simply with brick earth, and to make balls of this paste, which, after drying, are to be burned to the proper degree.

"Being master of the proportions, we may conceive that the factitious lime may receive any degree of energy desired equal to, or surpassing at pleasure, the best natural lime.

"Very fat common lime will bear 0.20 of clay to 1.00 of lime; moderately fat lime will have enough clay with 0.15; and 0.10, or even 0.06, of clay will suffice for these limes which are already somewhat hydraulic. When the proportion is forced to 0.33 or 0.40, the lime does not slake, but it pulverizes easily, and gives, when tempered, a paste which hardens under water very promptly."

Such is the process indicated by Mr. Vicat. But this engineer did not content himself with experiments on a small scale: a manufactory was established near Paris by his means, where artificial hydraulic lime is made in large quantities; he moreover exerted himself to extend the use of hydraulic mortar every where, and he succeeded. He has, therefore, rendered an important service to the art of construction, and I have done him the justice to make this acknowledgment, in the notices I have heretofore published.

In 1818, Dr. John, of Berlin, presented to the Society of Sciences in Holland, a memoir, which was published in 1819. This memoir, crowned in 1818, by the Society, answered the following question proposed by Society: "What is the chemical cause, in

whereof stone lime makes generally solid and durable masonry, than shell and what are the means of improving ime in this respect?" Dr. John has ced that shells require to be more calcined than common lime-stone: nks this owing to the shells being carbonate of lime than common lime-which contains earthy substances, ting the disengagement of the carbonic In making the analysis of sundry tones, he found that those which d hydraulic lime contained clay, oxide 1, &c. He called the foreign matters gave the property of hardening in *cements*; and says that it is possible, roducing cement in the dry way to rate lime which contains none. On considerations he made the following ments. He mixed the powder of shells, 1st, with $\frac{1}{10}$ of silicious sand—th several proportions of clay, varyom $\frac{1}{10}$ to $\frac{1}{8}$; 3d, with $\frac{1}{16}$ of oxide of nese. He tempered these mixtures by formed them into balls, let them dry air, and then burned them in a lime-r 96 hours. The following results btained: the first mixture was agglu- but friable, and was not a good the second mixture gave good results; third possessed no peculiar property. thor concludes that clay is the ingre-which gives to common lime the pro-of hardening in water; and he says thing can be easier than to procure ydraulic lime, either from shells or ure lime-stone, following the process ed: he adds that it is for construc- determine the best mixture to be n each case.

memoir by Dr. John contains the s of several ancient mortars; and several important observations of I shall have occasion to speak.

he third number of the *Annales des* of 1822, there is a very interesting r by Mr. Berthier, *Ingénieur en Chef* *es*; it contains the analysis of diffe-ime-stones, and several new views will contribute to form a more perfect of mortars. I shall have more than casion to cite his experiments, and his n on several important facts.

Raucourt, engineer of roads and s, published at St. Petersburgh in a work wherein he narrates the expe-s he made, following the process used Vicat, and adding several of his own. ergère, *chef du bataillon du génie*, analysis of this work, in the *Annales nes of 1824, Vol. IX.*

825, Mr. Hassenfratz published a *on mortars.* *This* work, which is voluminous, contains many practical details on the calcination of lime-stone in different countries, and exibits the actual state of knowledge, in the art of making mortars at the period of publication.

In terminating this reference to works on hydraulic mortars, which have appeared up to this time, I must introduce a fact, entirely new, announced by Mr. Girard de Caudemberg, engineer of roads and bridges, in a notice published by him in 1827. He states that the proprietors of mills on the river Isle, in the department of Gironde, discovered by accident, a kind of fossil sand to which they gave the name of *aréne*, which has the singular property, without any preparation, of forming, with fat lime, a mortar that handens under water, and has great durability. I shall have occasion to return to this important fact, and to report what Mr. Girard says, as well as to state the principal experiments which have been made with this substance, in other places where it has been found.

I was employed from 1816 to 1825 at Strasburg, at which place they had made no use of hydraulic line. I ascertained, however, that such lime was to be found in the neighbourhood. Almost all the hydraulic works connected with the fortifications of the place, having been badly constructed, and dating as far back as Vauban's time, were to be rebuilt. Twenty-five years' experience had taught me the great superiority of hydraulic mortars in the air as well as in the water—where, indeed, they are indispensable. I tried, therefore, the hydraulic limes, afforded by the environs of Strasburg, and found them excellent: they were, consequently, used in all the works both in air and water. All the revetments built from *port de Pierre* to *port Royal*, having a development of about 1650 yards, were rebuilt or repaired with hydraulic mortar. It was the same with the hydraulic works; they were rebuilt or repaired with the hydraulic lime of the neighbourhood.

An engineer who should use fat lime, even for constructions in the air, when there are hydraulic limes at hand, would be very censurable, because the expense is about the same, and, as regards the strength and durability of masonry, there is a vast difference in favour of the hydraulic mortar. But in countries where no hydraulic lime is to be had, or only that of mediocre quality, what should be done? Shall the engineer adopt the process of Mr. Vicat, which consists in making an artificial hydraulic lime? I answer, emphatically, that I think not; in this case, occurring very often, it is, in my opinion, preferable to make hydraulic mortar by a more direct process which I shall point out.

There are two modes of obtaining hydraulic mortar; the first consists in mixing natural, or artificial, hydraulic lime with sand; the second consists in mixing ordinary fat lime with certain substances, such as puzzalona, trass, certain coal-ashes, and brick dust, or tile dust. I feel bound to correct here, an assertion touching these mortars, not perfectly accurate, of Mr. Gauthey, Inspector of roads and bridges. In his excellent *Treatise on the construction of bridges*, this Engineer says (Vol. II., page 278) that "fat lime is very proper for constructions out of water; but will not answer in the composition of betons to be placed in water, because the mortars in which it is used, even when mixed with puzzalona, and placed in water as soon as made, do not harden, but remain pulverulent." This is far from exact: because mortar composed of fat lime and puzzalona hardens very soon in water, and acquires, in a short time, very great strength. This fact was known to the ancients, for Vitruvius speaks of it, as will be seen further on.

I should not refer to the error into which Mr. Gauthey has fallen in this instance, if he did not enjoy a reputation so justly elevated. His highly esteemed work being in the hands of every engineer, it was to be feared that this remark of his would prevent constructors from making hydraulic mortars by the direct union of common lime and substances analogous to puzzalona. My experiments will show that, in countries where hydraulic lime is not to be had, instead of following the process of Mr. Vicat, it is preferable to make hydraulic mortar by a direct mixture of fat lime with substances of a similar nature to puzzalona. These experiments show also that fat lime is far from being always proper for construction out of water; although Mr. Gauthey, in the beginning of the sentence, states it to be.

ART. II.—*On slaking Lime; manner of making Mortar; observations on Hydrate of Lime.*

There are three modes of slaking lime. The first consists in throwing on the lime, as it comes from the kiln, enough water to reduce it to thin paste. This process is the one generally employed with fat lime. Too much water is added, almost always—that is to say, as much as is required to make it a thin cream. In this state it is run into vats; after some time it thickens, and it is then covered with a layer of sand or earth or preserve it from contact of the air, which would soon convert the upper portion into a carbonate. It is a common opinion that the longer the lime has been kept in this state the better it is. My experiments will show that this is not true, at least not always true: since some fat lime that I had experimented with, which had been lying in this condition, gave, in the air, when the mortar was composed of lime and sand only, very bad results.

The thickening of the lime in the vats is due to the escape of water by filtration, by evaporation, and also to a third cause: for this thickening which is quite prompt, occurs equally when the vats are constructed in moist ground, and when the season is rainy. This third cause appears to me to be this: that the lime, having a strong affinity for water, solidifies the first portions very promptly, but requires a considerable time to saturate itself completely. These portions of the lime which have been too much or too little burned are, besides, slow to slake. I made the follow experiment to satisfy myself on this point. I took a portion of lime that had been lying wet in a vat for four years, it was quite thick, I added a little water to bring it to the consistence of sirup, and placed it in a stoneware vessel. I took an equal portion of fat lime, slaked fresh from the kiln, reducing this also to the consistence of sirup, and placing it in a similar vessel. After a short time, this last had become very thick, while the former retained its consistence of sirup; I then added water to restore the consistence first given. The thickening again occurred, but more slowly than at first. It was necessary to add water several times before the second lime would maintain the siruppy state. It results from this experiment that fat lime, slaked into a clear paste as it comes from the kiln, retains the power of absorbing water for a considerable time.

The second method of slaking consists in plunging quick-lime into water for a few seconds. It is withdrawn before the commencement of ebullition; slakes with the water it has absorbed, and falls to powder. It is preserved in a dry place. The operation is performed with baskets into which the lime, broken to the size of an egg, is put. Mr. de Lafaye, in 1777, proposed this mode of slaking lime, as a secret recovered from the Romans; it made much noise at the time, but experience has not realized the great results anticipated.

The third process consists in leaving the quick-lime exposed to the air. Its strong affinity for water causes it to attract the greater part of that which is in the surrounding air. Lime, thus exposed, slakes slowly without giving out much heat, and falls at last to powder. This mode of slaking is called air-slaking, or spontaneous slaking. It is employed, more or less, in several countries. It is spoken of in seve-

ks on constructions, and is generally ned. Mr. Vicat, however, appears it the preference, for, at page 20 of moir, he says: "Such are the three of slaking lime: the first is generally the second has hardly been tried, ex- an experiment at certain works; the is proscribed, and represented, in all atises on construction, as depriving e of all energy, to such a degree that ortions which have fallen to powder air, are considered as lost. We shall w speak of the processes of Rondelet, t, and others, because they do not dif- ch from those described. We shall rther on, that, as regards spontaneous , these proscriptions of authors who, ng every thing, repeat without exa- on the errors of those who preceded are founded on false observations and erving only of mistrust." Mr. Vicat nounced that a mortar made of sand, t lime which was air-slaked, resisted ly at the end of ten years, the test ed by Mr. Berard for frost-proof ; he says on this subsect "a hint, those who have written and spoken h against air-slaking, and in opposi- to the opinion which I have had to in singly, unable to invoke to my aid periments but my own." The re- have obtained are far from confirming icat says, as will appear by the ex- nts reported hereafter.

Vicat gives, at page 20, experiments by him to ascertain the amount of g of fat limes and of hydraulic limes, ing by the three modes. He found st mode to be that which gave the t volume of paste, with both kinds e. On comparing the bulks obtained second and third modes, it was found ith fat lime, air-slaking gave greater han slaking by immersion, and that it e reverse with hydraulic lime.

Strasburg, an attempt was made to on a large scale, the mode of slaking mersion, pointed out by Mr. Lafaye; e process was found to be attended convenience and embarrassment. It ssary to procure a stock of baskets— ak up the larger pieces—to secure en who will be faithful in holding the nder water only the given number of s, which is not easy; a portion of me is lost, falling in powder to the of the vessel of water; when the s reduced to powder, it is requisite sure it before making the mortar, and *there be a wind, much will be lost. bjections caused the procees to be ed in favour of that about to be de-* and which amounts to the same thing. It is founded on the following observations: if quick-lime be plunged into water it absorbs, in a certain number of seconds, a quantity sufficient to reduce it well to powder. We shall have then a like result by throwing the same quantity of water on the lime, and avoid the inconveniences attending the plunging into water. Since 1817, this process has been employed at Strasburg, where considerable masses of lime were operated on. A small building was erected near the works, into which the hydraulic lime, not allowed to arrive too fast from the kiln, was put, to be protected from the weather; the building was boarded on the sides and top, and, in case of rain, covered with a tarpaulin. By the side of this lime-house, a larger shed was constructed, tho top only being boarded; a plank floor, on which the mortar was mixed, was laid under this shed. There was a measure, without a bottom, which contained about 10 cubic feet, each dimension of the box being about 2·20 feet; this was placed on the floor and filled with lime; which being done, the same measure was used for the sand, which was placed round the lime, without covering it: with large tin watering pots of known capacity, water, equal in bulk to about one-quarter the bulk of the lime, was thrown on: the workmen knew they were to empty the watering pots but a given number of times; and the lime being all in sight they saw that they should throw the greater quantities on those parts of the heap where lay the largest lumps of lime. As soon as the slaking became energetic, the lime was left to itself until the vapours had ceased; it was then turned a little with a shovel, or a rod was thrust in, and if any lumps were found still entire, either for want of water, or because they were too much burned, a little water was poured on the lumps. A regular form was then given to the heap, and the surface being slightly pressed with the back of the shovel, the lime was covered with the sand that had been placed around it. This process was completed towards evening—as many heaps being prepared as it was presumed would be required during the whole of the ensuing day. By thus leaving the lime, over night, in heaps, the slaking is complete; portions which have too much water impart it to those which have too little, and the water becomes thus uniformly diffused through the heap. In the morning the sand and lime of each heap were mixed together, and passed twice under the rab (rabot) before adding any water: in this way, if there were any stones, or pieces of lime perfectly slaked, they were easily found and rejected. Water was then added in sufficient quantity to bring

the whole to the state of very soft paste; because in this dilute state the mortar is, with less labour, mixed more perfectly. Experiments which follow will show that it is an error to insist that mortar should be mixed with "*the sweat of the labourers*:" it is enough if the sand be well mixed with the lime; and this mixture is better effected, and in a much more economical manner, when the mortar is in a state rather thin, than when it is thick; another reason for making it rather thin is, that it often becomes stiffer than it ought to be, before it is used, in consequence of the lime preserving, as before stated, for a considerable time, the property of solidifying water. When the lime has been properly burned, the operation just described gives a homogeneous mortar not at all granular, and not exhibiting a multitude of little white specks, which are particles of lime that have been badly slaked. At Strasburg the precaution was always taken of making up only one or two heaps of mortar at a time; so that it should not have too much time to dry before being used, and that the masons might find it in the state of paste, in the heaps in which it was deposited after being well worked. In making the mortar only as it is needed, there is, besides, the advantage of avoiding the labour of remixing, in the frequent case of the works being interrupted by rain: it is best therefore to make the heaps of slaked lime into mortar, no faster than as they are wanted. Lime may be preserved in this way for eight or ten days without losing quality. If at the end of the day, all the heaps of lime have been consumed, new heaps should be formed for the consumption of the morrow: if a portion only have been consumed, this portion should be made good. This manner of slaking lime, and making mortar, gave very good results at Strasburg, and at other places in the vicinity where it was employed. It is seen to be a method analogous to that by immersion, recommended by Mr. Lafaye; but, by throwing upon the lime, just the quantity of water necessary to reduce it well to powder, instead of immersing it, much inconvenience and embarrassment are avoided, especially when operating with large quantities of lime.

An opportunity was presented of convincing ourselves of the goodness of mortar made by this method, it being necessary, in order to make a postern, to pierce through a revetment wall that had been built two years: the mortar had already acquired such hardness that the tools had much difficulty in cutting through the masonry.

In extensive works, it will be very advantageous, as regards economy, to make mortar with a machine. Several have been contrived with this object, but that which has succeeded best is a two-horse machine proposed and executed by Mr. Saint-Léger, formerly Captain of Engineers. The following is a brief description.

A circular trench, having the two sides sloping, is built of masonry; the section of the trench is a trapezoid 2 feet wide at bottom, 3 feet 4 inches wide at top, and 1 foot 4 inches deep; the inner circle of the trench is 9 feet 4 inches in diameter; at the centre there is a mass of masonry, in which is fixed a vertical axis, of wood, 6 feet 8 inches long, and 8 inches square, and which is bedded in the masonry about 5 feet; the top of this axis is formed into a cylinder $5\frac{2}{10}$ inches in diameter, and 6 inches high; around which is fitted a collar of cast-iron, carrying laterally two horizontal trunions $3\frac{2}{10}$ inches in diameter, and $4\frac{8}{10}$ inches long; a piece of wood, 26 feet 8 inches long, is notched at its middle upon the collar of the vertical axis. (Instead of one piece of wood, two might be taken, each 13 feet 4 inches long, by strongly securing, with iron, their junction with the vertical axis). This piece is placed horizontally, and is about 13 in. square in the middle, lessening towards the ends, so as to serve as an axletree to two vertical wheels with broad felloes—6 feet diametor of wheel, and 6 inches breadth of felloe. These two wheels rest in the circular trench in such a way that the one touches the exterior and the other the interior slope of the trench. A horse is attached to each extremity of the horizontal bar, and their united efforts cause the wheels to revolve in the trench; behind each wheel, attached to the horizontal bar, by means of a hinge, is a scraper of wood armed with iron, these follow the movement of the wheels, scraping the two sides of the trench so as to throw the mortar under the wheels. These scrapers, of which the lower end is within two inches of the bottom of the trench, are attached by hinges in order that they may rise over any obstacle.

Mortar is made in this machine in the following manner. A cubic metre (35.34 cubic feet) of lime in the state of paste is thrown into the trench, and the horses are started; a little water is added if necessary, and when the paste has become quite liquid and homogeneous, the proper quantity of sand is thrown in by the shovel, without arresting the movement; in about 20 or 25 minutes the mortar is made. With this machine 12 batches of 3 cubic metres each ($12+3+35.34$ equals 1272·24 cubic feet) may be made in 10 hours labour; the requisite agents being four labourers, two horses and their driver, and 1 supertending mason

expense of making a cubic metre of r, amounts in Paris to about 0 dol. 10c.; a considerable saving over the common mode of making mortar.* It is de- therefore that frequent use be made machine, in places where there are tant constructions. The description ven is extracted from the *devis-modèle* corps of engineers, and was prepared ut. Col. Bergère of the Engineers.

It is stated above, that at Strasburg, lime which was to be made into mortar, was slaked to dry powder, and left in that state for twelve hours at least before giving it the quantity of water necessary to convert it into paste. I made the following experiments with limes of the environs of Strasburg, to ascertain the volume obtained in powder and in paste, when the proper quantities of water are used to produce those states.

TABLE I.

)esignation of the lime of ich the volume is taken as unity.	Volume of water used in bringing it first, to a state of dry powder.	Volume produced of dry powder.	Volume of water used, in all, to bring to state of paste.	Volume produced in state of paste.
me of white marble....	$\frac{1}{2}$	$2\frac{1}{2}$	$1\frac{6}{10}$	$1\frac{1}{2}$
t lime of Strasburg	$\frac{1}{2}$	$3\frac{1}{2}$	2	$1\frac{3}{4}$
llow lime of Obernai ..	$\frac{1}{2}$	2	$\frac{3}{4}$	1
ue ditto ditto....	$\frac{1}{2}$	$2\frac{1}{3}$	$1\frac{1}{6}$	$1\frac{1}{6}$
unstat lime	$\frac{1}{2}$	$2\frac{1}{2}$	$1\frac{1}{2}$	$1\frac{1}{5}$
llé lime..............	$\frac{1}{2}$	$3\frac{1}{3}$	$1\frac{1}{2}$	$1\frac{3}{5}$
tkirch lime	$\frac{1}{2}$	$1\frac{5}{6}$	$\frac{5}{6}$	1
rdt lime	$\frac{1}{2}$	$2\frac{1}{4}$	1	1
etz lime	$\frac{1}{2}$	$2\frac{1}{4}$	$1\frac{1}{6}$	$1\frac{1}{20}$
ulogne pebbles	$\frac{1}{2}$	$1\frac{1}{6}$	$\frac{1}{2}$	$\frac{3}{4}$

the limes in the above table, were fresh from the kiln. I reduced them vder in a mortar, sifted them, and for quantity, about one quart. Thus, ample, I took a measure of quick lime te marble, and throwing upon it half sure of water, I obtained $2\frac{1}{2}$ measures slaked to powder, which I measured it was cold. The quantity of water on is shown in the second column, e quantity of lime obtained in powder n in the third column. I was ob- o throw upon this lime in powder, one re and one-tenth of water in addition luce it to paste. Adding this last quantity of water to the half measure used in the first instance, the total is $1\frac{6}{10}$ measures of water, absorbed by the lime, in being reduced to paste: this is shown in the fourth column. The fifth column shows that I obtained $1\frac{1}{2}$ measure of lime in paste. I followed the same process for all the limes of the above table, producing a uniform consistence of paste, by adding the water little by little. Experience had taught me that these limes were reduced to dry powder by throwing on one-fifth of their bulk of water; and that as much as one-half their bulk might be thrown on without the powders ceasing to be dry; beyond this term, moist powder would be obtained. The only lime on which I threw less than half its bulk, was that at the bottom of the table of the Boulogne pebbles; on this I poured but $\frac{1}{3}$ its bulk of water; as this lime forms a moist powder with $\frac{1}{2}$ its bulk of water, I was obliged to restrict myself to one third. This table shows that these different limes afforded very different volumes of powder with the same quantity of water: that the quantities of water absorbed to produce the state of paste were very different, and, also, that the volumes of paste differed much. Experiments which follow will show, that if the limes in the table, those are the most hydraulic which absorbed the least water in passing to the state of paste, and which gave the smallest bulk both of powder and of paste. Those limes, of the table, which are not hydraulic, are those which gave the greatest volumes in powder and in paste. There are

	dol. c.
e day of superintending mason....	0 $66\frac{1}{2}$
ays of labourers, at 0 dol. $28\frac{1}{2}$	1 14
ys of horses, at 0 dol. $42\frac{3}{4}$	0 $85\frac{1}{2}$
y of driver	0 38
nd tear and repair for one day....	0 $09\frac{1}{2}$
g wheels one day................	0 07
nd tear of shovels and barrows, for 4 labourers..................	0 $07\frac{1}{2}$
encies, 1-10th of all	0 32
expense for 36 cubic meters = bic feet	3 60

l to 0 dol. 10 per cub. metre—or 0028 per cubic foot.

quality of the mortar is superior to that y the common process; and it is well to re- that the time during which the mortar is s precisely that in which the labourers re- t is therefore their interest to let the ma- *o as long as possible,* and consequently to *he mortar more perfect,* so that the super- *ll be directed chiefly to* the proportions of ure. This note is extracted from the *lèle du corps du Génie,* p. 71.—Tr.

in the table two kinds of Obernai lime, one yellow and the other blue; they are of the same limestone, but one more highly calcined than the other. When this lime has been burned, it is of an ashy-grey, and when too much calcined, of a decided blue. It was upon the two extremes of calcination that I made the above experiments, they show that the degree of calcination has a sensible influence on the swelling of this hydraulic lime.

As the swelling of lime, shown in the above table, was obtained with quite small quantities, and with pulverized quicklime, I caused experiments to be made at the mortar beds on a large scale, with fat lime and with Obernai lime; these being the two kinds of lime ordinarliy used upon the works. The following results were obtained. Fat lime was taken immediately from the kiln, and measured in the boxes in use at the mortar beds; care being taken to break up a portion of the lumps of quick lime into smaller pieces in order to occupy the interstices between the larger pieces, and to have the measure well filled; water, in quantity sufficient to bring the lime at once to paste of the consistence of mortar, was thrown on withont delay, and the quantity of paste thus obtained was measured. Proceeding thus—one measure of quicklime, just from the kiln, required two measures of water to produce the state of paste, and yielded 1.83 of paste, which differs but little from Table No. 1, wherein the produce is 1.75. The same operation was repeated with Obernai lime, after having rejected vitrified pieces, and those which had nôt been sufficiently calcined: one measure of this lime absorbed 1.30 of water in being reduced to paste, and in this state gave 1.30 of lime. This differs somewhat from the result in the Table.

The difference may be owing to this, that in the experiments of the Table, the lime was pulverized, and was twice slaked; that is to say had two successive applications of water, while in the larger experiment the lime was not broken up, and had water poured on but once. The degree of calcination might, also, have had some influence.

Many metallic oxides are susceptible of absorbing and solidifying a certain quantity of water forming compounds which possess peculiar properties. It is to these compounds that the term hydrate has been assigned. It has been seen above, that lime is a metallic oxide, and that this substance *absorbs and solidifies* a large quantity of *water; but the* quantity of water absorbed *by lime in forming* its hydrate is not exactly *known. Berzelius* asserts that the hydrates are formed of water and oxides in such proportions that the quantity of oxygen tained in the oxide is equal to the qua of oxygen contained in the water; but Thenard does not admit this law: he that the experiments on which it is fou are not numerous enough, nor suffici precise, to allow its definitive admission is certain, nevertheless, says this celeb chemist, that amongst the hydrates have as yet been examined, those which tain the most water, are those, also, of the oxides contain the most oxygen. cording to Berzelius, the hydrate of li obtained by throwing upon quick lim water necessary to reduce it to thin (*bouille*), and exposing this paste in a or platina crucible to the heat of a spi wine lamp. After having dried the hy of lime in this manner, it is weighed the quantity of water it has absorb known by the augmentation of weight. zelius made two experiments, one wi grammes of lime and the other wi grammes. He found in the first e ment, that the lime had increased in v 32.1 per cent., and in the second, 32. this second experiment there was, fore, an augmentation of four-tenths than in the first. He attributes this ence to an absorption of carbonic aci he admits, as good, only the first e ment, in which 100 parts of pure lim taining 28.16 parts of oxygen, are com with 32.1 parts of water, containing parts of oxygen; whence Berzelius cludes that the water absorbed by pur contains a quantity of oxygen equal t contained in the lime.

I have repeated the experiment of zelius by operating on 20 grammes of lime, using, as he did, a spirit-of-wine and a platina crucible. I was surpri obtaining an augmentation of only 22 cent. I repeated the experiment s times, successively diminishing the ness of the wick, and as I did this, th retained more and more water. I inf therefore, that the hydrate of lime d poses with a feeble heat; and that, if zelius obtained a greater result in the s experiment than in the first, it was due to the absorption of carbonic acid ing that the operation lasts only a time; but to this, that heating with an flame, two volumes of hydrate of li which one was triple the other, the s volume should lose most water by the But there is a fact which proves with great facility the hydrate of lime aba a part of its water. All those wh made mortar of lime newly slaked, h ceived that it becomes very dry i time. If, when in this state, it

for some time without adding water, it will be brought back nearly to the same moist state it had at first; and drops of water may be seen on the mortar. The same result is obtained with lime alone. It follows from this, that simple friction (working) decomposes the hydrate of lime, and that a feeble heat produces the same effect. To know, therefore, the quantity of water which enters into the hydrate of lime, it appears to me that other means of drying should be resorted to than fire.

The various kinds of lime are used in constructions, only after having been brought to the condition of hydrate: nothing, therefore, that relates to the properties of this compound, is a matter of indifference. As yet, few experiments have been made to determine the quantity of water that should be given to lime in making mortar. I proposed undertaking several experiments on this point, but time failed me. The matter should be attended to, because opinions are much divided thereon, for want of exact experiments.

The following are the principal properties of hydrate of lime: it is white, pulverulent, and much less caustic than quick lime; it easily abandons to heat the first portion of water, but it requires a high temperature to drive off all the water entering into its composition. This hydrate absorbs carbonic acid; experiments which follow show that it has, also, the property of absorbing oxygen, and that lime sustains important modifications in consequence of this absorption of oxygen. According to the chemists, lime is incapable of absorbing a fresh quantity of oxygen: but according to my observations, there is no doubt that the hydrate of lime absorbs a considerable quantity. I shall give, in the following Article, experiments which I made on this subject.

(*To be continued.*)

WORKING OF THE NEW AMERICAN PATENT LAW—NOTICES OF RECENT AMERICAN PATENTS.

(From the *Franklin Journal* for Nov.)

The notices of Patents, granted by the United States, have been omitted since the destruction of the Patent Office, with all its Records and Models, on the 15th of Dec. last; these notices we now resume, and on doing this, the Editor offers the following remarks, and explanations, upon certain points, which *appear to him to* be of *interest to those in any way concerned* in patents *for useful inventions, &c. &c.*

Under the operation of the acts of July *4th, 1836, and of the 3rd* of March, 1837, *by which all former laws* relating to patents, were repealed, all applications for patents are subjected to a critical examination in the Patent Office, and if the things claimed, are known to be old, or if that which is proposed to be done, contravenes the established laws of Mechanical and Chemical Philosophy, the patent is refused; subject, however, to an appeal from the decision of the office. Under this law, there are two examiners appointed, of whom the Editor (Dr. Jones) is one, and it will, therefore, be manifest that the tone of his animadversions, must be modified by the existence of these circumstances. Under the official examination, a large class of applications, will be rejected, and never, therefore, meet the public eye; this will be a source of sufficient mortification to those who have dreamed of reaping a golden harvest, without the lash of criticism. It must not be inferred from these remarks, that our list of patents will become a mere detail of approved inventions; the fact will be far otherwise; for although the office is now possessed of judicial power to a certain extent, and can arrest what is old, what is contrary to the laws of nature, what is deemed altogether trifling, it would be stepping out of the line of its duty, and transcending its legitimate powers, to refuse a patent for an alleged improvement or invention, because the Examiners, or the Commissioner, may believe the thing worthless. They are not to act under the guidance of mere opinion, but must, and ought to, give the sanction of the office in all cases where there is apparent novelty. The utility is a question to be subsequently settled between inventors and the public. Nor is the absolute amount of novelty, a question for this office, as a very large amount of utility, not unfrequently results from a trifling change in the construction of a machine; the duty of the office in this case, is to see that the claim does not embrace more than the invention of the applicant; and, whenever there is a doubt respecting the propriety of rejection, the decision of the office will always be given in favour of the claimant, who, in such case, has an undoubted right to a final determination of his interests, by a Court and Jury.

The number of patents hereafter issued for quack medicines, will, under the operation of the existing law, be much diminished, and, perhaps, it would be for the public benefit, could they be entirely cut off from the sanction of an exclusive right; but this cannot be done in all cases. Where compounds substantially the same with those known to the practising Physician, are attempted to be patented, they will, of course, be excluded, but they must be granted when the compound appears to possess novelty, and is not manifestly

such a nature as to produce public injury; the Journal, however, will fully make known every recipe for a patent medicine, accompanied by such remarks as may appear just and proper.

The enquiry is frequently made, what proportion of the applications under the present law, are successful? Without taking the trouble to estimate the precise number, it may be stated, that not one third pass as originally presented, a large number being returned for amendment, and modification of the claim; probably about one half of those applied for, are eventually granted.

FASTENINGS FOR HARNESS, *Warner Hayden, New Milford, Susquehanna County, Pennsylvania, January* 21.—The patentee says, that he effects the object proposed, of fastening harness, "by means of metallic clasps, screws and pins, which I use as substitutes for the buckles, usually employed for that purpose."—The improvement is not confined to any particular part of the harness, but the clasps and pins are to be used, both on the traces, and on the smaller straps. The clasps may be made more ornamental than buckles, and are simple in construction, consisting of a flat plate with a staple, or staples upon it, through which the end of a trace, or strap, is to be passed, and in which it is confined by a sufficiently stout screw pin, or pins, passing through the staple and leather strap, screwing into the plate below. One screw is generally deemed sufficient; but for traces, or other parts where there is much strain, two may be employed.

In some cases it is proposed to have two staples upon a plate, to receive the strap, and between the two staples, to have a pin firmly attached to, and rising from the plate, so that by bending the strap, the pin may enter one of the holes, when, by straightening the strap, the fastening will be completed. The claim is to "the within described manner of making and using such fastenings for harness, wherever buckles has been heretofore employed for that purpose."

We have examined specimens of harness thus fastened, and the plan is certainly recommended both by its beauty and neatness; but we have heard some objections made to it, by practical men, and have not learnt, whether these have been found valid upon actual trial. It has been said that the bend of the leather, over the rim of buckle, is essential to the sustaining the strain upon the tongue, or pin, without which the leather, *or pin, would be likely to give way*. It has *been apprehended*, also that the screws would *be much more liable* to come loose, than a *buckle*, a circumstance calculated to produce *very injurious* effects.

TRANSPARENT DOOR PLATES, *William C. Austin, Greenville, Augusta County, Virginia, January* 31.—Plate glass is to be set in a suitable metallic frame, one surface of which glass is to be ground, to render it semi-transparent. Upon this, plate letters of metal are to be affixed, by pins passing through holes drilled in the glass, or in any other suitable way. A hole is to be cut through the door, upon which the plate is to be placed, so that by means of an ordinary entry lamp, the name may be rendered visible at night, whilst the glass will form an agreeable ground for letters by day.

The Patentee says, I do not claim the use of door plates formed of transparent plates of glass, lettered on the back, and contained within metallic frames, as of my invention; but what I do claim, is an improvement on such plates, by cutting a hole through the door, and affixing them in such manner as that a light within the passage, or hall, shall, at night, shine through them for the purpose herein set forth."

Names and other devices, have been painted upon glass, both transparent and ground, but probably there may be novelty enough in the proposed plan of affixing ground glass, as door plates, to sustain a patent; and to Physicians there may be utility in their employment, but their extensive adoption is a very doubtful affair.

MACHINE FOR BORING AND MORTISING, *John H. Power, Norwalk, Huron County, New York*.—This Machine is principally intended for boreing and mortising holes in posts, for post and rail fence. It consists mainly of three screw augers, placed side by side, in a frame, with pinions on their shanks, so geared that by turning a crank, the three augers will revolve, the middle one in a direction the reverse of the other two. To cut the three holes into one, there are four chisels, which advance with the frames, and are so situated that they pare off between the holes. The middle, or left hand auger has two projections on it, which are claimed, but the object for which they are formed, is not very apparent. The combi-nation of the augers and chisels, is also claimed..

IMPROVEMENT IN ELLIPTICAL, OR DOUBLE BOW SPRINGS, FOR CARRIAGES, *William Croasdale, Hartsville, Bucks County, Pennsylvania*.—The springs are made and put together in the usual manner, my improvement consisting (says the patentee in his specification) of a spiral spring, or springs, which I interpose between the two bows of the elliptical spring, and sometimes between the ends of the elliptical springs and the axle, and between them and the under side of the carriages

In most cases I deem a single spiral spring sufficient, and this I make of steel wire, of from one-eighth to three-eighths of an inch in diameter, twisted with the coils open, and placed in the middle between the two bows, so as to extend from one to the other, the ends of the wire entering into holes prepared to receive them.

I generally wind these springs with the coils each of the same size, when the outline will be cylindrical, but sometimes I wind them so that their outline may be that of a double cone joined at their smaller ends, and the coils then pass more or less the one within the other, when pressed closely together. The outline may also be conical, or the spring may be bent in a zig-zag form, or otherwise, but I deem the spiral best.

If preferred, there may be spiral springs placed under the elliptical springs, their lower ends bearing on the axle-tree; and sometimes also above the ends of the elliptical springs, extending up to, and bearing against, and a suitable piece of timber attached to the under side of the carriage, or vehicle; thus there may be four such springs without, whilst there may be two or more such springs placed at suitable distances apart within the elliptical springs, so graduated as to adapt them to the double bow. The spiral springs thus placed, give greater elasticity and liveliness to the elliptical spring, and also tend to prevent its breaking.

IMPROVEMENTS IN PRESERVING TIMBER FOR VARIOUS PURPOSES, *Webster Flockton of Great Britain; residing in Spa Road Bermondsey, Surry county, near London.* Mr. Flockton's invention consists in impregnating timber, or wood of various descriptions, with a metallic solution, by saturating the essential oil of vegetable tar with the oxide of iron. He considers this the best and cheapest means of carrying his invention into effect, though he does not confine himself to the precise means hereafter described, as variations may be made; his object being to impregnate timber or wood with a metallic oxide.

I take (says the patentee) a quantity of tar (either Stockholm, Archangel, or American) which I submit to the process of distillation, and the apparatus, or still, which I use for this purpose, is similar to what is called a pitch still, which is made of copper, and well known, and forms no part of my invention, nor does the process of distillation for separating the essential oil from tar, which is effected in the manner following. *The still which I use will contain about 400 gallons, but I do not put into it more than three-quarters of that quantity of tar, or twelve barrels, of the usual size,* of either of the kinds before mentioned. The first product will be the acid of the tar, bringing with it a light-coloured essential oil which separates immediately and floats upon the surface of the acid in the receiver, which I *prefer of wood* (a cask with one head furnished with a cock for the withdrawing the acid from below, being applicable to the purpose), after some time the acid will cease and the essential oil will come over in a very considerable stream which I collect from the receiver to the extent of about four gallons to the barrel, or forty-eight gallons in the whole, including that which came over in the first instance with the acid; the fire is then to be withdrawn and the contents of the still, which by the extraction of the essential oil has become *pitch*, allowed to remain *in the still* until the following morning to cool, then it may be let off by means of a pipe fitted with a brass or iron plug, into a large receiver of cast-iron, or other suitable material, and finally put into casks for sale.

I will now proceed to describe the combining of the essential oil with the other materials for the making of my "Metallic Solution." To effect this, I place *two*, or more, large casks upright, removing the upper head of each, and throw into them well rusted iron hoops, or tin cuttings. I then pump into them one hundred gallons, or more, of the essential oil of tar, before described, completely covering the metal. This oil I cause to be repeatedly pumped every day from one cask to the other for about six weeks, by which time the oil will have become very black and much increased in gravity, whilst the iron hoops, or tin cuttings will appear quite bright and free from oxide.

They are then to be taken out and piled up in an open space of ground and set fire to, for the purpose of burning of the oil, and afterwards laid by for re-oxidation, which may be much facilitated by pouring over them a weak solution of common salt and water; when they have again become rusted they are fit for use.

I will now proceed to describe the method I pursue in saturating timber and wood with the metallic oxide.

For saturating piles *already* driven into the sea, forming jetties, or piers, I cause an inch auger to be passed down the centre of the piles to the bottom end, if possible, or as far down as can conveniently be done, and the "liquid oxide" poured down the hole until filled. This is to be repeated as as often as may be thought necessary, but, generally, in two or three days it will be found oozing through the pores of the wood, depositing the incrustation of iron, which, is

combination with the *essential oil* of the *tar*, resists alike the action of the water and the attacks of the worm. A wooden plug or tree nail is then to be driven fast into the hole, which may be removed by the auger at any time for the purpose of giving the piles a fresh supply. This method is likewise applicable to the timber used in blocking streets, the wood work or railways, and to all wood subject to damp, or moisture, or the attacks of worms, or other vermin. For out-door buildings liable to dry rot, it may be used cold in the usual way of varnish or tar, with a brush; for being perfectly liquid it penetrates most rapidly, drying completely in eight or ten hours, when a second dose may be given. Paint applied afterwards dries quickly, but for most purposes two or three applications of the preparation render any other coating unnecessary; for as soon as the pores of the wood become filled, it assumes the appearance of varnish.

AMERICAN ELECTRO-MAGNETIC TELEGRAPHS.

(From the *Franklin Journal*.

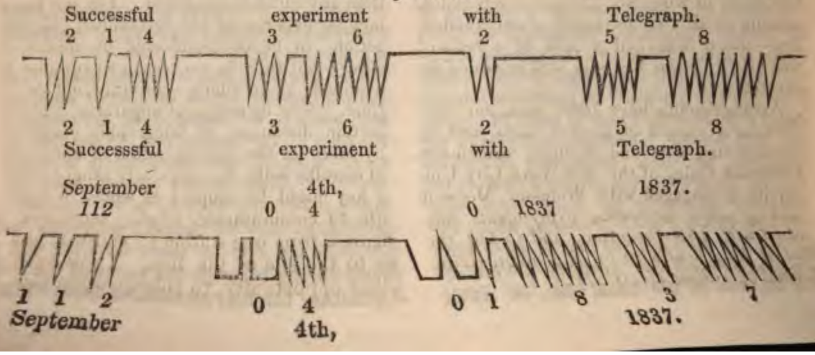
On a recent visit to New York, the Editor had an opportunity of examining the apparatus constructed by Professor Morse, of the University of that city. The subjoined account of it from Professor Silliman's Journal for the present month (October) will afford a correct idea of the manner in which the communications made by it are recorded, and read off. Our examination of it was subsequent to the addition of the thousand feet of wire, and, although in an experimental essay of this kind we do not look for a perfect arrangement of the instrument employed, yet its operation might be pronounced perfect, and no reason was perceived why its indications may not be given at greater distances than by the ordinary telegraph, whilst they will be uninfluenced by the causes which limit the application of the latter to day-light, and clear weather.

1. *Morse's Electro-Magnetic Telegraph.*—While a contest is waging in several countries of Europe—in England, Scotland, France, and Germany, for the discovery and invention of the Electric Telegraph, it may not be amiss to state, that America also claims to be an independent discoverer and claimant for prority in the invention. The dates, the names of the inventors, and other circumstances will doubtless, ere long be published, and then the world can judge between the conflicting parties. In the mean time it is well ascertained, that Professor Morse, of the New York City University, conceived and planned, five years ago, an Electric Telegraph, while on his passage home from France, and immediately on his landing, he commenced the machinery. Early last spring, in April, the general features of his plan were very extensively published in the newspapers, and very lately, in August, we learn that several telegraphs on the basis of electricity are in various stages of progress in Europe.

The distinguishing features of Professor Morse's telegraph are a *Register*, which permanently records in characters easily legible the fullest communication, and the use of but *one wire* as a conductor; although for greater convenience of communicating at all times, and of having a whole circuit at command from each extremity of the line he will use four wires.

On September 2nd, Professor Morse tried an experiment with a circuit of copper wire one thousand seven hundred feet in length, and of the minimum size of No. 18 wire. The record of the Register was sufficiently perfect to demonstrate the practicability of the plan. On the 4th of September some slight changes were made in the machinery, when the Register recorded perfectly the following signs:—

Specimen of Telegraphic writing made by means of electricity at the distance of one-third of a mile.



The *words* in the diagram were the intelligence transmitted.

The *numbers* (in this instance arbitrary), are the numbers of the words in a Telegraphic dictionary.

The *points* are the markings of the Register, each point being marked every time the electric fluid passes.

The Register marks but one kind of mark, to wit, (V). This can be varied two ways. By intervals thus (V VV VVV) signifying one, two, three, &c., and by reversing thus (Λ); examples of both these varieties are seen in the diagram.

The single numbers are separated by *short*, and the whole numbers by *long intervals*.

To illustrate by the diagram, the word "successful" is first found in the dictionary, and its telegraphic number 214 is set up in a species of type prepared for the purpose, and so of the other words. The types then operate upon the machinery and serve to regulate the times and intervals of the passages of electricity. Each passage of the fluid causes a pencil at the extremity of the wire to mark the points as in the diagram.

To read the marks, count the points at the bottom of each line. It will be perceived that two points come first, separated by a *short* interval from the next point. Set 2 beneath it. Then comes one point likewise separated by a *short* interval. Set 1 beneath it. Then come four points. Set 4 beneath it. But the interval in this case is a *long* interval, consequently the three numbers comprise the whole number 214.

So proceed with the rest until the numbers are all set down. Then by referring to the Telegraphic Dictionary, the words corresponding to the numbers are found, and the communication read. Thus it will be seen that by means of the changes upon *ten* characters, all words can be transmitted. But there are *two points* reversed in the lower line. These are the *eleventh* character, placed before a number to signify that it is to be read as a *number*, and not as the representative of a word.

Since the 4th of September, one thousand feet more of wire No. 23 have been added, making in all two thousand seven hundred feet—more than half a mile of a reduced size of wire; the Register still recorded accurately.

Arrangements have been made for establishing a circuit of several miles, and for constructing new and accurate machinery. Professor Gale, of the New York City University is engaged with Professor Morse in making some interesting experiments connected with this invention, and to test the effect of length of wire on the magnetizing influence of voltaic electricity.

To the foregoing notice, we append an article published in Thomson's Annals of Philosophy, vol. VII. p. 162, first series, February 1816. This article is from the pen of Dr. John Redman Coxe, of Philadelphia, and it is believed that the idea of the employment of galvanism, as a telegraph, which it suggests, was then original. Those who are acquainted with the history of the progress of electricity, as evolved by the ordinary machine, are aware that experiments had been made with a view to its employment for a similar purpose, but from the inherent difficulties of the subject, the project had been abandoned.

It is not pretended that the state of our knowledge, on the subject of galvanism, was such at the time the foregoing suggestion was made, as would have enabled any person to apply it practically, this, if done, will be due to the recent discoveries on the subject of Electro Magnetism, a subject which has been very successfully pursued by the philosophers of our own country, and particularly by Professor Henry, of Princeton. As some of the philosophers of Europe are disputing upon the question of the authorship of the proposition for the employment of galvanic electricity, telegraphically, we have thought that it would not be altogether inopportune, or uninteresting, to republish the article above referred to.

"*Use of Galvanism as a Telegraph; in an extract of a letter from Dr. J. R. Coxe, Prof. Chem. Philadelphia.*

"I observe in one of the volumes of your Annals of Philosophy, a proposition to employ galvanism as a solvent for the urinary calculus, but which has been very properly, I think, opposed by Mr. Armiger. I merely notice this, as it gives me the opportunity of saying, that a similar idea was maintained in a thesis, three years ago, by a graduate of the University of Pennsylvania.

"I have, however, contemplated this important agent, as a probable means of establishing telegraphic communications, with as much rapidity, and perhaps less expense, than any hitherto employed. I do not know how far experiment has determined galvanic action, to be communicated by means of wires; but there is no reason to suppose it confined, as to limits, certainly not as to time. Now by means of apparatus, fixed at certain distances, as telegraphic stations; by tubes for the decomposition of water and of metallic salts, &c. regularly ranged, such a key might be adopted as would be requisite to communicate words, sentences, or figures, from one station to another, and so on to the end of the line. I will take another opportunity, to enlarge upon this, as I

think it might serve many useful purposes; but, like all others, it requires time to mature. As it takes up little room, and may be fixed in private, it might in many cases of besieged towns, &c. convey useful intelligence, with scarcely a chance of detection, by the enemy. However fanciful in speculation, I have no doubt that sooner or later, it will be rendered useful in practice.

"I have thus, my dear sir, ventured to encroach upon your time, with some crude ideas, that may serve to elicit some useful experiments in the hands of others. When we consider what wonderful results have arisen from the first trifling experiments, of the junction of a small piece of silver and zinc in so short a period, what may not be expected from the further extension of galvanic electricity! I have no doubt of its being the chiefest agent in the hands of nature, of the mighty changes that occur around us. If the metals are compound bodies, which I doubt not, will not this active principle combine those constituents in numerous places, so as to explain their metallic formation? and if such constituents are in themselves aeriform, may not galvanism reasonably tend to explain the existence of metals in situations to which their specific gravities certainly do not entitle us to look for them?

LIGHTING AND VENTILATING THE HOUSE OF COMMONS.

On Friday evening, January 5, Lord Duncannon, Mr. Baring, and several other members of parliament, attended in the House of Commons for the purpose of observing the result of a new plan, proposed to the committee by Dr. Reid, for lighting the house with gas. In the lobby were stationed two engines and a strong body of firemen, in readiness to operate upon any part of the house, in case of accident from any outbreak of flame. Between the benches of the galleries were also stationed men, with buckets of water, for the protection of the roof, to which the experiment was almost exclusively confined. Three lines of tubes were laid down upon an inclined plane, immediately under the slopes of the roof, and over those windows in each side of the ceiling from which, in the daytime, the light descends. Behind the row of panes of glass, in the wall over the door opening into the reporters' gallery, was placed a single tube. There were no tubes at the other end of the house. A few minutes after four o'clock, the main cocks, which are all on the Abbey side, were turned, and three lines of strong illumination shot down light on the floor from the roof, and one line from the reporters' gallery. In the former, the flames issued in oval jets, about an inch in length, and a quarter of an inch asunder, not less than 1500 in a row, and incessantly flickering. From the single tube at the reporters' gallery, each flame issued in a triple jet. The view had a dazzling effect from the floor; and the light, without being in the least distressing to those who stood beneath, enabled one to read the smallest print with ease. No smell whatever was perceptible, the carbon not being permitted to come below the glass.

The object of the proposed use of gas (the effluvium being prevented from descending, as already stated) is to discontinue the burning of wax candles in the chandeliers; and thus, by saving a quantity of air hitherto carbonified, for the respiration of persons within the area, to give greater efficacy to Dr. Reid's plan of ventilation, which has not been as yet carried out. To promote this plan, the number of holes in the floor are now being doubled. Through these the air ascends very densely when the carpeting is off the floor: it rushes in at the doors with the force of a gale; and it is said that, if a man were to stand near the valve of the shaft over the ceiling, the current of air would blow him over. The expense of gas is calculated at nearly 30*l.* a night; that of candles, at not more than 5*l*: Mr. Wakley, who was in the House, said the gas burned, in the chambers above the ceiling, at a temperature of 130°, drying up the lath and plaster, and all adjacent combustible matter on the roof; so that the fabric would, from the slightest accidental creation of flame, take fire, and burn like touchwood. In his opinion, the glass in the windows would crack before ten hours. (*Times*, January 6, 1838.)

Several noblemen and gentlemen were present, on the evening of December 30, in the House of Commons, to witness certain experiments made by Dr. Reid with reference to the ventilation and lighting of that house. In consequence of the complaints made upon this subject during the present session, the attention of Dr. Reid was called to it; and, accordingly, that gentleman came to town from Edinburgh to enquire into the causes of the inconveniences of which the members had complained. It would be difficult to furnish our readers with an idea of the precise method adopted for diffusing and equalising the progress of the air from the lower chambers of the House of Commons, and to explain the precautions by which Dr. Reid considered it necessary to give complete effect to his plan. It is sufficient to observe, that the complaints had reference to the dryness of the atmosphere,

and the quantity of dust which was stated to have risen from the floor of the house, and to be inhaled by the members. In order to prevent the first of these inconveniences (namely, the dryness of the atmosphere), extensive arrangements had, we understand, been made before the opening of last session of Parliament, but were suspended, owing to the concurrent approbation expressed by members of all parties of the improved ventilation of the house by the steps already taken.

For preventing any inconvenience from the diffusion of dust in a room frequented in all weathers, and all times of the day, by a large body of persons, Dr. Reid had, besides other things, introduced a hair-cloth, of particular texture, for the floor. This cloth, during the whole of last season, appears to have been lifted with comparative regularity and attention to the object for which it was designed. The result of Dr. Reid's examination, since he has come to town, is, that an article of a totally different texture, and wholly unfit for the purpose, has been substituted for it during the present session; and that even this had not received the attention bestowed on the hair-cloth of last session. It will be obvious that it would be impossible to avoid all inconvenience from the diffusion of small particles of dust, but by the adoption of another plan suggested by Dr. Reid when his plans were first put into execution, and by which a current of fresh air would descend from the ceiling, instead of ascending, as at present, through the floor. For the adoption of this plan, however, a new mode of lighting the house would be indispensable. The first step to which must be the removal of the lights at present used within the body of the house. It was part of the original plan that these lights should occupy a space separated from the lower portion of the body of the house by a ceiling of glass, and through which, in fact, the house is at present lighted in the daytime.

A trial of this plan took place on the evening of the 30th of December last; and although the preparations are as yet necessarily very imperfect, having been got up within the short interval of twenty-four hours, so far as we could judge, we anticipate a successful result. (*Morn. Chron.* Jan. 1, 1838.)

HYDROSTATIC MEASUREMENT OF TIMBER.

(*From the Architectural Magazine* for January.)

In the West India Docks, mahogany logs *are weighed in a crane*; and their weight *marked on one end.* Now, it would be *practicable also to measure these logs at* the same moment that they are weighed: I mean, taking their solid contents. Thus, suppose a log weighs 25 cwt. 1 qr. 14 lb.: it would be, when reduced, 25·375 cwt. Then, as the cubic foot of fresh water is $62\frac{1}{2}$ lb. weight, we have only to multiply the specific gravity of mahogany by $62\frac{1}{2}$, and we find the weight of the foot of mahogany to be $66\frac{1}{2}$lb. nearly. With this as a divisor, and the 25·375 cwt. reduced to lbs.

making 2842·000 as a dividend,

$$\text{we have } \frac{2842}{66{\cdot}5} = 41 \text{ feet odd.}$$

Thus we see how, by means of water, of which the mahogany is a palpable form, we can measure the products of water.

The only difficulty in obtaining by this means a compound weighing and measuring crane is, that we cannot find two pieces of the same wood, or wood of the same name, of the same specific gravity. If all oak, all fir, all ash, all teak, all mahogany, were of the same specific gravity, we should have a constant multiplier for each sort of wood; and then, by the simple operations of multiplication and division, we could accomplish our purpose. The rule, in words, is: Multiply the specific gravity of the wood, whatever it be, by $62\frac{1}{2}$, and the produce will be the weight of a cubic foot. Then divide the weight of the log or stick in pounds avoirdupoise, by the weight of its cubic foot, and the quotient will be the solid contents in feet of the stick.—*A. J. Jan.* 1, 1838.

NOTES AND NOTICES.

New Rotary Steam-Engine.—At the British Alkali Works, Stoke Prior, near Bromsgrove, a steam-engine has been invented by a labouring mechanic, and is daily in full operation, which will daily supersede every other now in use, and that too, in a very short period of time; as the simplicity of its construction, the smallness of its size, and the almost nothingness of its cost, will necessarily bring it speedily into notice among all persons whose business may require the aid of so useful an auxiliary. Its size is not more than twice that of a man's hat, and the expense of a five-horse power will not exceed in cost half a score pounds. Its form is cylindrical, being about 18 inches in diameter, and 22 deep. The steam is admitted through a hole in a hollow circular belt, (attached to a wall,) upon which it revolves, and works it by a diagonal action, against an upright piston, being forced out by pressure of a diagonal plate, which divides the interior into two portions. The rotary action is beautifully managed by means of a perfectly spherical steam-tight joint, at the end of a fixed inclined arm, towards which joint the upper and lower surfaces of the interior part of the cylinder are made to slope, after the form of the exterior of an hour-glass. Upon these the diagonal plate performs its revolutions, such movement being permitted through an opening, (from the circumference to the centre,) equal in width to the thickness of the before-named upright piston, up and down the sides of which it continually works. To the centre of the bottom of the cylinder is fixed a shaft, having attached to it a wheel which com-

[illegible] the motion that may be required, and this is all the machinery of which it consists! Patents have been procured from every European [illegible] American, and no secret [illegible] to the public, [illegible] pieces, and in a [illegible] [illegible] experiment informs [illegible] invention [illegible] on [illegible] the [illegible] very [illegible] the same time [illegible] a small [illegible] Railway with great [illegible]

[illegible] There is now [illegible] a steamer, which is intended to make the [illegible] experimental trip to New York. She is named the Columbus. She will be propelled by Mr [illegible]'s Patent Vapour Engines, and can carry [illegible] days' fuel at the same [illegible] as a steam vessel on the common plan, [illegible] power and tonnage, can carry twelve days' fuel. She will sail from the Thames for the Mersey as soon as the former river shall be free from ice, and will leave Liverpool shortly afterwards for New York. *Liverpool Standard.*

Warming Public Offices.—A Copenhagen Journal mentions a new way now used in the war-offices of that capital, of warming rooms and public offices, by placing 48-pound cannon balls, made red hot in iron boxes of fine sand, which are put under the seats of stools, chairs, &c. The warmth thus communicated to the sand will keep up in an apartment an heat of 60 deg. of Fahrenheit for nine hours, the windows and fire-places being stopped.

Destroying Fire-Damp.—We understand that Mr. Charles Borrows, mason, of St. Austin, after studying many years the best method of destroying damps in coal mines, which have proved fatal to so many thousands of human beings, has at length succeeded in constructing a machine which will effectually destroy them, and enable the miner to prosecute his work with the aid of a lighted candle, without lantern or any covering in perfect safety. —*West Briton.*

Professor Steinheil's Galvanic Telegraph.—The King of Bavaria, was lately witness to a trial of the galvanic telegraph of Professor Steinheil. The wire was conducted from Bogenhausen to the residence of M. Steinheil, in the Lerchenstrasse, passing over the houses and domes of the city. His Majesty, who was at Bogenhausen, put questions to the professor, and received instantaneous answers. The wire is to be taken down from its present position, and conducted through tubes placed in the ground, and we have every expectation that this invention will shortly be brought into extensive service.—*Times, Feb. 8th.*

Steam Navigation on the Rhine.—The steam navigation on the upper Rhine, a part of the river till latterly almost unknown to travellers, appears to meet with astonishing success. The number of passengers last year was no less than 29,209, and it is anticipated that even this number, which German journalists characterise as incredible, will be considerably augmented in the present year, an additional service being now about to be established up to Basel. The boats are to go in one day from Basel to Mannheim, and thus within four days and a half a passenger may make his way from Switzerland to London!

Joyce's Stove and Fuel.—If the numberless letters we have received respecting the heating apparatus exhibiting at the Jerusalem Coffee House may be admitted in evidence, the subject is one in which the public take great interest * * * unaided, empirical genius has often heretofore hit on fortunate discoveries:—the self-acting valve of the steam-engine was the ingenious result of idleness; and it is very probable that a gardener, annoyed at being obliged to rise in the night to attend his hot-house fire, may have stumbled in the dark on a process which had escaped those seeking for it in the light of science; indeed, we have learned that the secret has been communicated *sub sigillo* to a scientific experimentalist of high reputation. We have heard, too, what the material employed is, but the patent not being yet perfected, we shall say no more than that it is a well known and common inflammable substance, altered in its chemical energies and calorific properties by a secret preparation of a cheap and fusile description. Under the hands of the scientific gentleman in question, the relative qualities of the prepared and unprepared substance have been accurately tested, and the result is favourable to the pretentions of the patentees. But perhaps the most striking difference is in the respective products of combustion,—a difference decisive of the salubrity of the process, and the absence of all mephiticvapour.—*Athenæum.*

Warming-Machines.—The "Hamburgh Correspondent" on noticing the exhibition of the new warming-machine, of wonderful effects and unknown principles, at the Jerusalem Coffee-house, adds the remark, that for some years, an apparatus of apparently the same description called a "quick-oven," has been in use at Berlin. It is heated by spirits of wine, and at a small expense affords a tolerable heat, but unluckily of no long duration.

Petersburgh Water Company.—Following as usual the fashion of Paris, Petersburgh is now about to become possessed of a Water Company. A Joint Stock Company has been formed to provide the houses, by means of steam-power, with a good supply of water from the Neva, which it is well known enjoys a reputation for pleasantness and salubrity only second to that of the Nile. An exclusive privilege has been granted to the Company for twenty-years.

Shareholders' Newspaper.—Joint Stock Companies have multiplied to such an extent in Paris, that it has been thought expedient to set up a newspaper especially devoted to that single topic. It is entitled "L'Actionnaire" (The Shareholder,) and has distinguished itself by attacking a number of schemes of the rotten description so common in France and elsewhere. If it be impartially conducted, it will of course do good, but "we have our doubts." It is almost needless to add, that the "Actionnaire" is itself the property of a company of "Actionnaries" Newspapers and theatres are very favourite subjects for joint stock companies in France, although there, as here, the principal objects of speculation are railroads, canals, gas factories, coal mines, water works, and so forth.

Gresham Lectures.—The refractory Gresham Lecturers have given in at the first onset and succumbed to the non-paying resolution of the Common Council. The lectures are therefore now regularly delivered at the theatre of the City of London Schools.

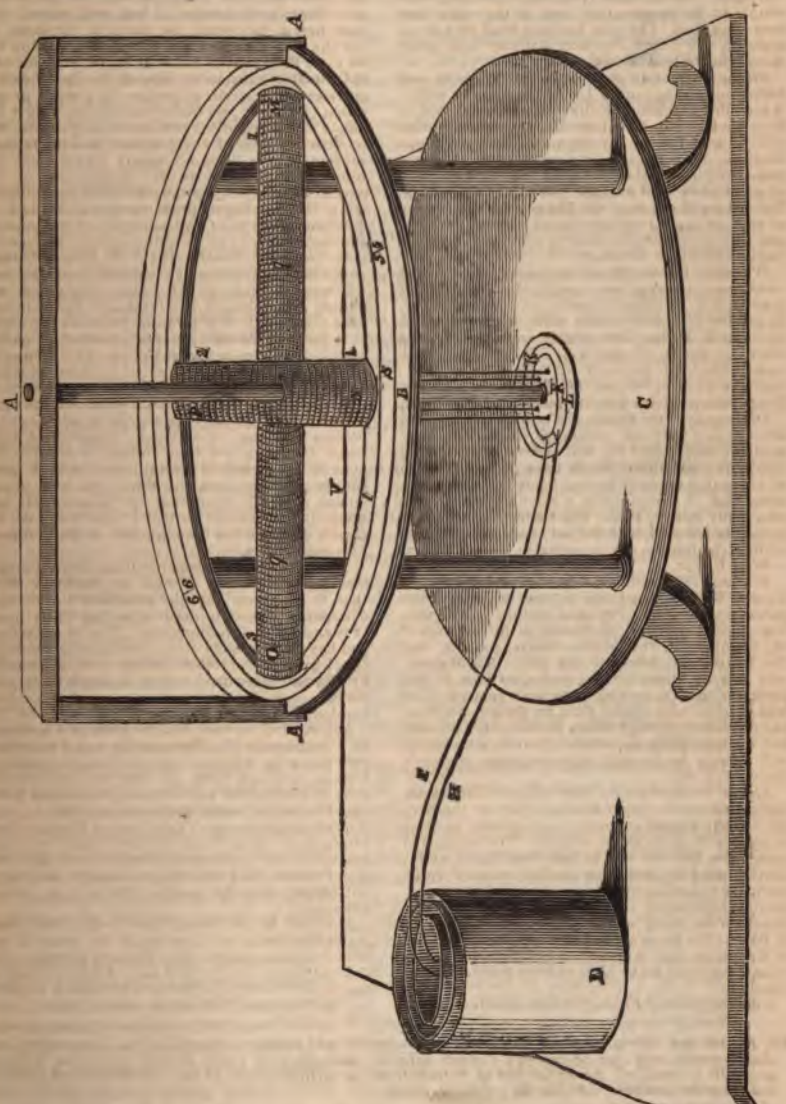
Death of Mr. William Ettrick.—It is with deep regret that we have to announce the death of our talented correspondent Mr. William Ettrick. We shall be much obliged if Nautilus will forward us the paper to which he refers in his letter, containing the "obituary" of our deceased friend.

LONDON: Published for the Proprietor, by William Angus Robertson, at the Mechanics [illegible] Peterborough-court, between 135 and 136, Fleet-street.—Sold by A. & W. *Mage*[illegible] *Galig*[illegible] Paris. Saturday February 10, 1838.

Mechanics' Magazine,

USEUM, REGISTER, JOURNAL, AND GAZETTE.

o. 758.] SATURDAY, FEBRUARY 17, 1838. [Price 3*d*.



DAVENPORT'S ELECTRO-MAGNETIC ENGINE.

(Patentee's specification, from the *Franklin Journal* for November last.)

The machine for applying the power of magnetism, and electro-magnetism, is described as follows: The frame A A A may be made of a circular, or any other figure, divided into two, or more platforms, B and C; upon which the apparatus rests, and of a size and and strength adapted for the purpose intended. The galvanic battery, D, is constructed by placing plates of copper and zinc, alternately, of any figure, in a vessel of diluted acid: there are two conductors, H and I, one from the copper, and one from zinc, in the vessel D, leading to, and in contact with copper plates, K and L, placed upon the lower platform. These plates, or conductors, are made in the form of a segment of a circle, corresponding in number with the artificial magnets hereinafter described; they are placed around the shaft, detached from one another and from the shaft, having a conductor, leading from the copper plate of the battery, to one of said plates on the lower platform, and another conductor leading from the zinc plate of the battery, to the next plate on said lower platform, and so on alternately (if there be more than two plates on said lower platform) around the circle.

The galvanic magnets, M, N, O, P, are constructed of arms, or pieces, of soft iron in the shape of a straight bar, horse shoe, or any other figure, wound with copper wire *q*, first insulated with silk between the coils: these arms project on lines from the centre of a vertical shaft R, turning on a pivot, or point in the lower platform; said copper wires *q*, *q*, extending from the arms parallel, or nearly so, with the shaft down to the copper plates, K and L, and in contact with them.

The galvanic magnets, are fixed on a horizontal wheel of wood V, attached to the shaft.

The artificial magnets S, T, are made of steel, and in the usual manner. They may be of any number, and degree of strength, and fixed on the upper platform, being segments of nearly the same circle as this platform; or if galvanic magnets are used, (which may be done,) they may be made in the form of a crescent, or horse-shoe, with their poles pointing to the shaft.

Having arranged these artificial magnets, on the top of the upper circular platform, there will be a corresponding number of magnetic poles—the north marked 5, and the south pole 6. Now we will suppose the machine to be in a quiescent state; the galvanic magnet, No. 1, being opposite the south pole of the artificial magnets, the galmagnet No. 3, will of course be opposite the south pole No. 6, and the galvanic magnets, No. 2 and 4, will be opposite each other, between the poles just mentioned.

There being a corresponding number of copper plates, or conductors, placed below the artificial magnets around the shaft, but detached from it, as well as from each other, with wires leading from the galvanic magnets to these plates, and in contact with them, as before described, these wires will stand in the same position, in relation to the copper plates, that the galvanic magnets stand to the artificial magnets, but in contact with the plates.

Now in order to put the machine in motion, the galvanic magnet No. 2, being charged by the galvanic current passing from the copper plate of the battery, along the conductors and wires, becomes a north pole, whilst, at the same time, the magnet No. 4, is charged by the galvanic current passing from the zinc plate of the battery, and becomes a south pole; of course the south pole of the galvanic magnet No. 6, will attract the north pole of the galvanic magnet No. 2, and will move it a quarter of a circle; the south pole of the galvanic magnet No. 4, being at the same time attracted by the north pole No. 5, causes the said magnet No. 4, also, to perform a quarter of a circle: the momentum of the galvanic arms will carry them past the centres of the poles No. 5 and 6, at which time the several wires from the galvanic magnets, will have changed their positions in relation to the copper plates, or conductors:—For instance, the north pole No. 2, having now become a south pole, by reason of its wires being brought in contact with the conductors of the zinc plate, and No. 4 having in like manner, become a north pole, its wire having changed its position from the zinc plate to the copper plate, the poles of the galvanic magnets are, of course, now repelled by the poles that before attracted them; and in this manner the operation is continued, producing a rotary motion in the shaft, which motion is conveyed to machinery, for the purpose of propelling the same.

Remarks by Dr. Jones, the Editor of the Franklin Journal.—The subject of the foregoing specification is one of great interest, and it has arrested a corresponding portion of public attention; we are likely soon, therefore, to have the question solved, whether this new power can be advantageously applied to the propelling of machinery as a substitute for the steam-engine. Most of our readers, it is presumed, have seen Pro-

Silliman's notice of Mr. Davenport's
ie, published in the Journal of Science,
il last, which contains much informa-
specting the attempts which had been
or the producing of motion by elec-
gnetic apparatus. Since that period,
has been received from Europe, show-
at experiments upon this subject are
ress under the direction of some of
st distinguished philosophers in va-
ortions of that quarter of the globe.
do not know by whom, or at what
he first successful experiment of pro-
a direct rotary motion, by the elec-
gnetic apparatus, upon a principle
ous to that upon which Mr. Daven-
as proceeded, was performed. As
however, as June 1833, an article
ed in the London Mechanics' Maga-
roposing such an apparatus, and giv-
gure of one which it was supposed,
answer the purpose; a supposition
was, undoubtedly, well founded. Not
ter this, Mr. Saxton, we believe, pro-
a rotative machine by electro-mag-
but we are not informed respecting
icular arrangements.

history of the production of the ma-
atented by Mr. Davenport, is a his-
the successful efforts of an individual,
an indomitable perseverance, must
peradded, extraordinary natural abi-
His business is that of a blacksmith,
s advantages in point of education
ot greater than usually falls to the lot
sons in country places, engaged in
ursuits. Accident brought to his
one of Professor Henry's electro-
s, which he eagerly purchased, under
ction that he could render it avail-
a motive power; this was in the year
nd in July 1834 he had so far suc-
as to produce a rotative machine, and
effected in a country village, unaided
ntific knowledge, by books, or by
couragement of men of superior at-
ts, or with kindred spirits. What-
y be the final result of his labours,
its are of a high order, and he has
himself well worthy of the most
l success. Should his machine finally
lish that which he and many of his
anticipate, its value will be incalcu-
for although he may have been
ded in Europe, his claim as inventor
doubtedly prove valid in his own
, and ambition need not carry him
it. We have twice seen his machine
ation, formerly in New York, and
in Washington, where it was exhibited to the President, and the Heads of departments. So far as the evidence of a model is to be taken, its performance is quite satisfactory; and Mr. Davenport is now occupied in constructing one which is intended to drive a Napier press, requiring a two-horse power. This, should it succeed, will be a fair test of its value, and we confess that, although our expectations do not generally partake of the sanguine in such matters, not only our hopes, but we may say our confidence, has increased as we have become acquainted with the progress of the experiments which are being carried on.

We are well aware, that should it be eventually proved, that an available power may be obtained, which may be substituted for that of steam, its adoption would depend entirely upon its economy, with respect to which we cannot have satisfactory data until a machine of several horses power shall have been produced; the probability, however, is, that the cost of operating the electro-magnetic apparatus, will be much below that of the steam engine.

*9, p. 137.—By our late talented Correspon-
—Ed. M. M.*

OLD AND NEW PROCESSES OF TANNING.

Sir,—My letter upon the subject of Chaplin's Patent Process of Tanning has elicited two answers of very opposite characters—one from Mr. Cox, and one from Mr. Chaplin himself—to both of which it is necessary that I should reply: to the latter I shall first address myself.

I do not know whether any argument of mine is necessary to show that the description I gave of Mr. Chaplin's method of tanning, and that given by himself, are substantially the same. My knowledge of his process I obtained from general conversation amongst tanners, as also from an abstract of his specification, published in the *Journal of Patent Inventions* for May 1837, in which it states (p. 96) that "*hides* or *skins* having been divested of *their* hair, and prepared for tanning, *are* to be sewn up round *their* edges into the form of *a bag*," &c. The grammatical construction of this sentence led me to infer that two or more hides were to be sewn together to form "a bag;" and common sense, and a knowledge of the subject, suggested two. As, however, Mr. Chaplin must know his own process best, I acknowledge, that, so far, I have unwittingly erred; and having made this acknowledgment, I ask, how the action of

tanning would differ, whether the bag be of two hides or one?

As to "suspending" the bag. Here again, it appears, I was in error. But how does my mistake affect Mr. Chaplin's process? Not in the slightest degree, that I can perceive. According to the doctrine of the pressure of fluids, there would be the same amount of pressure upon the inner surfaces of the hide-bag, in whatever position it be placed; whether suspended, or lying on the ground, or placed obliquely against a wall. A little more scientific knowledge than even an acquaintance with chemistry, therefore, appears to be awanting amongst tanners—especially amongst those who are, under Mr. Chaplin's "new system," and after the "changes of men" necessary to that system have been effected, to monopolize the leather trade.

Mr. Chaplin's "unusual" mechanical means to bring tannin and gelatine into contact more quickly than usual, certainly do effect this, but they also do more; they force the tannate of gelatine formed by the contact, through the skin; and I have no doubt Mr. Chaplin finds on the outer surface of his hide-bags, after the tanning liquor has been in them for a short time, a white sticky substance. Now this substance is the very essence of leather, and ought to be kept *in* the hide. Hence the reason why all tanning processes in which mechanical pressure has been used, have failed, and I fear will fail;—and knowing this, I called the attention of tanners to the devising of some means to reduce the manual labour now necessary in the operations of the tan yard. In my belief it is to chemistry, and not to mechanics that we have to look, for a means of shortening the tanning process.

I perfectly agree with Mr. Chaplin in his remarks upon the character of the offence of infringing knowingly upon another party's patent right; and had he mentioned in his circular that a private arrangement had been entered into between Mr. Brewin and himself, it would have saved him the unpleasantness of being the subject of, and myself the disagreeable necessity of putting the interrogation I did, in regard to Mr. Brewin's patent.

Mr. Chaplin's observations upon *weight* are just; but I beg to remark that the reason why so much stress has always been laid upon this point as regards the quality of leather, is, because it has been found in practice that *weight* and *quality* increase or decrease in nearly the same proportions. Nor is Mr. Chaplin's leather an exception to this general rule, as some facts which will be found related in a subsequent part of this letter will show.

I am highly flattered that so talented a practical tanner as Mr. Cox, should entirely coincide with me in my ideas of the principles of the art of tanning. In consequence of the notice in his letter, I called at the office of your Magazine, and inspected the leather referred to. As regards quality, it is unequalled; as regards colour it is bad. Mr. Chaplin's remarks upon *weight*, however, equally apply to *colour*. I cut off a piece (about half an inch by two inches) of the sample, and taking it with me made the following experiments. I took pieces of a similar size of Chaplin's, Brewin's, and the best London hide tanned in the ordinary manner. I placed all these pieces in a bason of water, and the result was as follows. Chaplin's was saturated in three or four minutes, air bubbles quickly rising from the piece of leather; Brewin's in about the same time; the ordinary tanned piece in twenty minutes; and in Mr. Cox's, (the experiment being made in the evening) a small portion in the centre was found quite dry the following morning.

I confess that I am astonished at the above result as regards the new leather sent by Mr. Cox. I presume that it has been manufactured after the improved process, for which he has obtained a patent in conjunction with Mr. William Herapath of Bristol, and which appeared in your list for November last. The latter gentleman's well-known reputation as a chemist, leads me to believe that I was correct in my idea, that a chemical stimulant to the tanning process was yet to be discovered, which, while it quickened the operation, did not injure the fibre of the skin.

I shall, in common with "the trade," look with considerable anxiety for the publication of Messrs. Herapath and Cox's improvements in tanning; meanwhile I beg to subscribe myself

Your most obedient servant,

A TANNER.

Bermondsey, Feb. 13, 1838.

OWDER ENGINE, PENDULUMS, AND PADDLE-WHEELS.

—Your correspondent Mr. Potter's in No. 748, reminds me that for years I have thought of obtaining ive power from gunpowder; but it ot until about two years since that I make it convenient to attempt in ce what I had planned. My chief lty was the igniting of the powder; ter having seen the instantaneous rs by hydrogen gas and platinum, I d on making trial of that method. I must state that my plan is totally nt to Mr. Potter's idea, which I ill not answer in practice, although es me much pleasure to hear of being engaged in a similar pur-

er having finished the parts of my necessary for obtaining a reci- ing motion, I began making my ieter; but although it has not ed my sanguine hopes, I intend to y it, so that a constant supply of hall be ready for working. Per- galvanism may be a better plan for n. It was one of my first ideas, ing afraid of its constant efficiency, not like it.

hough I mentioned my gunpow- perations to others, they did not ve of the plan, principally from f an explosion; but I believe it to er from accidents than any steam- in use. I have called my machine o-pneumatic engine, and gave your s a hint about it in a letter of mine . 703 of your interesting Magazine elties, &c. for 1837.

ld Mr. Smith, of Dysart favour readers with a slight sketch of his ne, I think it would be very ac- ole, especially to *us* who jump the way. My ideas took this jump as ck as 1825; since then I have had uch experience as to the danger efects of steam-boilers not to de- better article. A machine much y model would last out ten engines eir boilers; in fact, some parts of ngine would last for centuries. the trade would not approve of.

plan of conveying the charge of er led me to a new idea in the *ng of cranks, which I believe may use in other machines.* Its result *when the fly-wheel is* reversed, *ks turning my cylindrical valves olve the same way.* Another result of my labour is, that should my boat, locomotive, or other connected machinery be stopped, the prime mover still goes on, and accumulates power to make up for "lee-way," as sailors would term it.

I have lately been engaged in clock-work, and have long intended trying plate mica for short pendulums. Should any of your readers know if it has been applied to that use, I shall feel obliged by their sending you an account of the result. My eight-day clock pendulum beating seconds, has only 10¼ inches length of pendulum, and might be still shorter.

Your "Old Correspondent" (No. 748,) has been blessed with the same maggot that I experimented on some years since. But although paddle-wheels on his principle work very *smoothly*, they do not propel so well as the old ones. I tried water wheels this way, that is, "resistance by displacement," but could not find any advantage.

I am, Sir,

Your's respectfully,

KEENANS.

Durham, Feb. 5, 1838.

BELL'S IMPROVEMENTS IN HEATING AND EVAPORATING.

Sir,—For the information of Messrs. Bell and Gyford, and those interested in the invention, I beg to state that His Majesty's Letters Patent were granted to W. G. Kneller in November 1828, for England and the colonies, and subsequently for Scotland and Ireland, for "a method or process, and certain apparatus by which he is enabled to evaporate liquids and solutions at a low temperature, and thereby to avoid the injury to which sugar, &c. are liable to from being exposed to too high a temperature," &c. The invention and improvements consist in forcing by means of bellows or any other blowing apparatus, atmospheric or any other air, either in a hot or a cold state through the liquid or solution subjected to evaporation, by means of pipes whose extremities reach nearly (or within such distance as may be found most suitable, &c.) to the upper or interior area of the pan or boiler containing such liquid or solution, &c. &c. The patent was established by proceedings in Chancery, and in the case of "Hullett *v.* Hague,"

tried in Hiliary Term 1831, in the Court of King's Bench, before Lord Tenterden and a Special Jury. Had Mr. Bell taken the usual precautions before taking out his patent, he would have saved himself much unnecessary and useless expence. Kneller's patent has been in operation several years in a manufactory in London, and in Germany, and I believe in France and Belgium, where patents have also been secured.

JUSTICIA.

London, Feb. 18, 1838.

NAUTILUS TO "O N"—ONE WORD MORE, AND THE LAST.

Sir,—I am fairly wearied out with replying to O. N.'s monstrous misconceptions. If his object in entering the pages of the *Mechanics' Magazine*, had been a desire of receiving a portion of enlightenment and information; and if, having received it, he had conducted himself with some small degree of decorum and humility, it would have been a pleasure to share in instructing him: but, when, on the contrary each successive communication from him is but a renewed specimen of floundering error, unaccompanied by any acknowledgement of former blunders; patience itself becomes exhausted, and the only resource left, is, to decline taking any notice of his future assertions, however extraordinary and unwarranted they may be.

What good effect, for instance, was produced in him, by my having pointed out to him the very line, wherein his error occurred, on which was based his memorable assertion of the impossibility of Nauticus's first question? Has he ever acknowledged *that* blunder? Does it not still remain unretracted, a glaring record of his absurd and groundless, though confident, assertions? I have, consequently, no design of following him through his last heavy entanglement at page 282; but I shall briefly notice two or three prominent assertions from which the complexion of the whole may be judged.

First, he complains of the "pompous *manner in which* Nautilus has headed *his last article.*" Now, it so happens, *that* Nautilus has *never* placed heading *or title to* any article which he has had the honor of transmitting to the *Mechanics' Magazine*, he has left that task to the discretion of the arranger of the articles, nor was he before aware that such was not the practice of every contributor.

Next follows a tedious demonstration, to prove that the phenomenon pointed out in your No. 751, is quite a matter of course, which must inevitably take place under all latitudes; "in one word, that as sure as the first event" (*i. e.* one vertical position) "takes place, so sure will the second" (*i. e.* a second vertical position) follow;" and he ends with the following climax:—"So much for Nautilus's interesting astronomical phenomenon." From this, it is evident, that O. N. has totally misconceived the nature of the phenomenon he thus attempts to criticise, it being of course understood that the two stars are, in *both positions above the horizon*, else why should the phenomenon be confined to a narrow zone of some thirty miles in breath upon the earth's surface? Is O. N. really *incapable* of understanding this.

After this, the *demonstration* "drags its slow length along" for a couple more pages, for the purpose of proving that in the latitude 55°.58 the perpendicular must fall *without* the triangle;—O. N. most unblushingly asserting, that the *contrary* is stated in my aforesaid letter; although in it, the limits "*a* to *b*" are expressly named as those within which alone, the perpendicular must be within the triangle.

I shall now dismiss the subject altogether, unless at least some nobler quarry than O. N. should offer.

I remain, &c.

NAUTILUS.

USEFUL HOUSEHOLD MACHINE.

Sir,—Having read an account in your valuable Magazine (No. 754,) of a new reaping machine, invented by Mr. Baldwin, I beg to inform you, that I invented and made a similar engine four or five years ago, which I have used ever since, both for cutting corn, and many other purposes; to wit: it will cut grass, and either lay it smoothly down or spread it lightly abroad; will roll a garden walk, whether green or gravel; also rake the ground and sow the seed after the plough. Nor do its uses stop here; it can be employed in-doors in thrashing the corn, by a man working it backward and forward, with a boy to b

I have also applied it to several
stic purposes, but not with the
success, for the intellect of my
its is not of the first order, and I
t drill them into the right way of
it. This deprives me of some of its
ts, for I cannot spare time for
drudgery, and so the machine
lle a great part of the year. Some-
for amusement in a leisure hour,
eel the machine round the yard,
ean and sharpen the dinner knives;
one of my chaps can master this
e operation without cutting their
s, knocking their heads against
ump handle, or perhaps driving the
ine against the wall. I, therefore,
to despair of being able to render
achine docile in the hands of my
rers, and as I cannot always super-
d its operations, except in mowing,
k if in my leisure I could convert
a fire-engine it might lay by as a
l article in case of emergency, and
ensate for the otherwise small em-
ent of it. To effect this I attached
the pump in the yard by way of
iment; but I found that a stout lad
pump handle without the assis-
of the machine, did as much as
of us together with the machine to
us! At first I was rather puzzled
count for this, but my perplexity is
now, and the thing is perfectly
cable. Its failure I attribute to the
nesty of the lad, who had always
n an aversion to my machine, and
upset my project he pulled lustily
pump handle when working by
elf, and tugged at the machine in
sing my efforts. I shall therefore
the thing another trial; in the mean
, if any correspondent can help me
plan for a fire-engine pump to fix on
achine without too much encum-
e, and such a one as I can make
lf, as I understand a little of these
ers. I shall be extremely obliged
im. I remain a well-wisher to your
esting and truly valuable Maga-

DAVID CRUMMEL*.

Gate, Southampton, Feb. 1, 1838.

Ve should be obliged if Mr. Crummel, would *r us with a more particular statement of the er in which he effects the many useful appli- of the reaping machine mentioned in his -Ed. D. D.*

DAVY'S ELECTRICAL TELEGRAPH.

Sir,—The favourable notice of your Correspondent "Moderator" on the subject of Mr. Davy's Electrical Telegraph, induced me to visit Exeter Hall, for the purpose of carefully inspecting the invention; and I am enabled to bear testimony to the general accuracy of your correspondent's remarks, and also of the great pleasure I experienced in the investigation of the apparatus. Under these circumstances I beg to offer a few additional remarks, in some measure corrective of those made by "Moderator".

As a preliminary observation I would suggest to the inventor the necessity of removing to some other part of the building, or if that cannot be accomplished of quitting the place altogether, and locating himself in some situation where his light may not literally be "hid under a bushel." He appears to be surrounded by rooms under repair or alteration, and his delicate apparatus. cousequently, smothered with dust; the room is also small, dark, and altogether of most unpromising appearance.

In front of the oblong trough or box, described by your correspondent, a lamp is placed and that side of the box next the lamp is of ground glass, through which the light is transmitted for the purpose of illuminating the letters. The oblong box is open at the top, but a plate of glass is interposed between the letters and the spectator, through which the latter reads off the letters as they are successively exposed to his view. At the opposite side of the room a small key board is placed (similar to that of a piano forte, but smaller) furnished with twelve keys; eight of these have each three letters of the alphabet on their upper surfaces, marked thus A. D. and so on.
B. E.
C. F.

By depressing these keys in various ways, the signals or letters are produced at the opposite desk as previously described. How this is effected is not described by the inventor, as he intimated that the construction of certain parts of the apparatus must remain *secret*. By the side of the key board, there is placed a small galvanic battery, from which proceeds the wire, twenty-five yards in length, passing round the walls of the room. Along this wire the shock is passed, and operates upon that part of the apparatus which

discloses the letters or signals. The shock is distributed as follows. The under side of the signal keys are each furnished with a small projecting piece of wire, which, on depressing the keys is made to enter a small vessel filled with mercury, placed under the outer ends of the row of keys; a shock is instantly communicated along the wire, and a letter or signal is as instantly disclosed in the oblong box. By attentively looking at the effect produced, it appeared as if a dark slide were withdrawn, thereby disclosing the illuminated letter. A slight vibration of the (apparent) slide occasionally obscuring the letter, indicated a great delicacy of action in this part of the contrivance; and although not distinctly pointed out by the inventor, is to be accounted for in the following manner:— When the two ends of the wire of the galvanic apparatus are brought together over a compass needle, the position of the needle is immediately turned at right angles to its former position; and again, if the needle is placed with the north point southward and the ends of the wire again brought over it the needle is again forced round to a position at right angles to its original one. Thus it would appear that the slide or cover over the letters, is poised similarly to the common needle; and that by the depression of the keys, a shock is given in such a way as to cause a motion from right to left, and *vice versa*, disclosing those letters immediately under the needle so operated upon.

A gentleman present hazarded a doubt as to the shock being energetic enough for a considerable distance. The inventor replied that he was in possession of means that would enable him to convey intelligence to any distance that may be required. Whether this was to be effected by *coils* of wire at intervals was not stated; such however appears to me a reasonable supposition. The difficulty of *tubing* for the protection of the wire was discussed. I took the liberty of suggesting the employment of a proper sized *tobacco pipe tubing*, which was received with satisfaction. It was also stated by a gentleman present that he was in possession of a smaller battery than that at Exeter Hall, and had obtained from it a power equal to *forging iron plate*: it will, he said, be shortly *produced*. Yours respectively,

CHRIS. DAVY.

3, Furnivals Inn, Feb. 5, 1838.

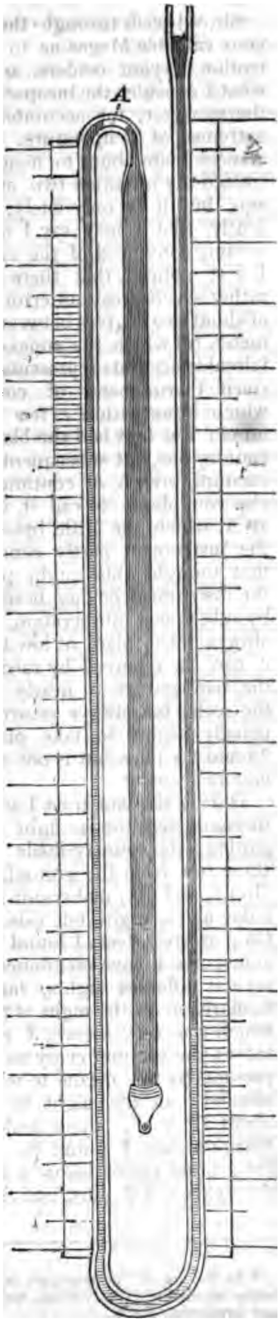
NOTICE OF A DEFECT IN SYKES'S THERMOMETER.

Sir,—I wish through the medium your valuable Magazine to draw the tention of your readers, and others, what I consider the incapacity of Syke thermometer, for accurately registeri extremes of temperature. The circu stances I am about to mention, first tracted my attention two or three ye ago, but it is only lately, or more cently, that I may say I detected, a became convinced of the cause of err I first noticed, that there was afte rather severe frost, an error or differe of about two degrees between the therm meter, (of which the annexed sketch tolerably accurate representation,*) an spirit thermometer of country m which hung within a few feet of e other; I at first laid the blame upon country one, but subsequently detect vacuum, breach of continuity, or w else you please to call it, in the sp at A, which the little brass holdfa the instrument partly concealed; first thought this might proceed f the instrument having been shaken, by subsequent observation, find th always takes place at low temperat it can be removed by raising care the temperature to nearly the lim the scale, but always returns; and usually begins to take place, bet 25 and 20 plus, but is not regular i commencement.

During the late frost I suspende thermometers on a light pole in garden; the country made spirit o three feet from the ground, the Sy (Jones, and Co., makers) at five feet a day and a night one (also Jones, Co.,) at seven feet; I found that th cumstance I have mentioned took several different nights, but more ticularly so on the night of the 20th which was very severe, I regularl moved the vacuum every morning i present, by the means to which I alluded: on the night in questio about $7\frac{3}{4}$ P. M., upon looking a thermometers I found the one n the ground rather below 2 degrees the Sykes's at 6° plus, and the high

* In the figure the meercury is repre being shaded with horizontal, and the perpendicular lines.

nearly 2° minus, and upon examination,



found that a vacuum was formed as represented in my diagram at A, to the extent of between 4 and 5 degrees, which is greater than I have seen it before, and which you will allow is a great error. The reason appears to me to be this: the mercury and spirit contract unequally, the more so the lower the temperature; according to the construction of the scale, by this contraction the column of mercury is depressed on one side, and elevated on the other, till they are so unequal that a great mechanical obstruction to the accurate registry of temperature takes place in the attempt of the mercury, by its greater specific gravity over the spirit to find its own level; by a reference to the diagram you will perceive that one column is only about 2½ inches in height, whilst the other is 9 inches; to proceed, the spirit still contracting and the mercury being unable to keep pace with it, partly from unequal contraction and partly from mechanical obstruction, as before stated, a vacuum must be formed, and takes place of course at the highest part of the tube. I am not aware that this has been noticed by any other individual, perhaps it may be a defect simply of the instrument in question, which usually agrees with the others at ordinary temperatures, but I have no other instrument of the same construction to compare with it; perhaps a diminution in the bulk of the column of mercury might remove this defect, but I am not sufficiently acquainted with the proper mode of constructing such instruments to judge.

Yours, &c.

I. W. Peares.

Gratham, Feb. 6, 1836.

ARTS AND MANUFACTURES OF ARABIA.

We are indebted to a book of travels which has just appeared*, for a little light on the hitherto obscure portions of Arabia which border on the Indian Ocean and the Persian Gulf. Lieutenant Wellsted, the author of the work, possesses the advantage, throughout his first volume, at least, of describing a section of country which has hitherto been scarcely, if at all, known to Europeans. The northern parts of Arabia

* Travels in Arabia, by Lieut. J. R. Wellsted, F.R.S., Indian Navy. In two vols. London, 18 Murray. 8vo. pp. 462, 482.

are comparatively well-known, chiefly through the labours of the German travellers, Burckhardt and Niebuhr: but the whole of the southern provinces have hitherto been almost as much hidden from observation as the interior of Africa. It is a portion of this *terra incognita* which it has fallen to the lot of Lieutenant Wellsted to explore and describe. Having been professionally employed as an officer of the Indian navy, in the survey of the southern and western coasts of Arabia, he had naturally acquired a desire to penetrate into the adjoining provinces. In 1835, an opportunity of doing so seemed to present itself: the Pacha of Egypt invaded "the coffee country" with a view to add it to his dominions, and Lieutenant Wellsted proposed to accompany his army to that district, and from thence to find his way to the province of Hadramant, which he intended to make the scene of his researches. In this he was disappointed by the unexpected and total route of the Pacha's forces, and he therefore directed his views to the adjacent province of Omán, to the ruler of which, the Imaum of Muscat, he was soon provided with the necessary recommendations by the Bombay government; recommendations which instantly procured him the utmost facilities for the execution of his purpose, and secured his safety, as far as might be in such a country, during the period occupied in travelling. The Imaum is one of the most remarkable rulers of his time; active, enlightened, enterprising, and anxious for the improvement of his subjects. He is also desirous of being on the best terms with the British government, in token of which he made a magnificent present of a man-of-war of 74 guns, to His late Majesty, who also received from him the valuable Arabian horses, which were recently *sold by auction* at Hampton Court! With a prince of these sentiments, our traveller was secure of a welcome reception; and such he found.

We shall not follow Lieutenant Wellsted through the narration of his "adventures by flood and field," but pass on at once to the sketches which follow of the state of the country and its inhabitants generally, especially in reference to the practice of the useful arts; sketches which derive their chief interest from the fact already noticed, that every particle of the information afforded is necessarily new. Our author's report on literature and the arts generally, is by no means flattering :—

"The existing state of learning, the arts and manufactures, does not in Omán rise superior to the low ebb at which they are found in other parts of Arabia; indeed, in all these respects they are far inferior to their neighbours of Yemen. Though I purposely sought amidst the most intelligent persons, I found but one who had any knowledge of astronomy, or indeed of literature, or of the sciences generally; nor do they possess a wish to cultivate them. We must not, however, on this account conclude that there is any want of capacity or intellect. One individual in particular, named Sayyid Ibn Kalfán, who had been educated in Calcutta, was sufficiently versed in Nautical Astronomy to be able to take the sun with a sextant and artificial horizon, to calculate his observations, and to rate chronometers. He had been in command of several of the Imám's largest ships, and has on more than one occasion navigated the Liverpool (74) between Zanzibar and Maskat.

"My instruments excited at first, more attention than I desired; but this feeling soon died away when they were informed they were not made of gold. I could not, during my stay, obtain a book or manuscript on any other subject than commentaries on the Koran and divinity in general: on these points, together with reading and writing, their children are alone instructed."—Vol. i. p. 318.

Matters are not much better with manufactures than with learning, as might, perhaps, be rationally expected :—

"At some of the principal towns sugar is manufactured in large quantities; but, although the cane is of a very superior quality, the material, owing to some difficulty which they cannot get over in granulating it, has but an indifferent appearance; it forms, however, the principal export from Maskat, where, as well as at Neswah, and several of the other principal towns; they manufacture large quantities of ulwah, a mixture of sugar, honey, ghee, and almonds, boiled to a dense paste, of which large quantities are sent to India and Persia in shallow earthen basins about ten inches in diameter. * * * * Cotton, canvass, and cotton cloths of a coarse texture, are manufactured by the men at their own houses. Of these, the Lúngí is the most common and valuable; they are mostly about ten feet long, and two feet six inches, or three feet broad, and striped horizontally with red and blue. They

are used either to bind round the waist, or as turbans; their price varies from five to ten dollars. The females spin and prepare the yarn. At Bení Abá Hassan, I saw in an open shed about thirty silk-weavers at work; the colours were good, but the workmanship was coarse, and the devices rude. In the northern provinces, the kamaline (a large woollen cloak) is fabricated; but their quality is far inferior to those brought from Nejd.

"I have elsewhere had occasion to observe, that there are but few artizans in Omán. At the principal towns blacksmiths manufacture the spear head, the crooked dagger, called a jamber, and some rude knives: copper pots and dishes are also made by another class; but silversmiths are far more numerous than either. Considerable sums are lavished by the females in the purchase of various silver ornaments, and their children are literally burdened with them. I have counted as many as fifteen ear-rings on either side; and their heads, breasts, arms, and ancles are decorated with the same profusion. There are also many workers in gold, but the articles which they turn out of hand appear not so well finished; the metal they use seems of the purest kind." Vol. i. page 319.

Omán is, indeed, far from eminent as a manufacturing country, and its robbers, the Bedouens, are far more numerous and more dextrous in their vocation than its artizans. The Imaum has the prospect of "a good seat of work" before him, in the reduction of such a territory to a state of even passable civilization!

Lieutenant Wellsted's second volume refers to a part of the world much better known than that to which his first is devoted—the northern coasts of the Red Sea. Although this portion comes later in the work, the labours to which it refers preceded by some years those recorded in the first volume. Lieutenant W. having accompanied Captain Moresby in the survey of the coasts in question, ordered to be undertaken by the East India Company in 1829, in furtherance of the too-long-delayed plan for effecting a communication by steam between England and India. This volume contains but little information of a nature similar to that we have quoted from its predecessor.

We are sorry to observe, in conclusion, that the style of Lieutenant Wellsted is so excessively ungrammatical as to detract greatly from the gratification of the reader, especially as this is a fault which might easily have been remedied by means well-known to most publishers, if not most traveller-authors. We do not recollect ever to have met so glaring an instance as that which occurs in the elaborately-engraved dedication of one of the maps to Sir John Barrow, "*through* whose exertions," we are told, "Modern Geography is *so pre-eminently indebted*." And yet, as the notice at the foot informs us, this very map appears under the sanction of no less dignified a body than "the Royal Geographical Society!"

SKETCH OF THE HISTORY OF THE HOSIERY AND BOBBIN-NET MANUFACTURE.*

The stocking-frame was the first invention successfully used in England for superseding hand labour by machinery, in the manufacture of clothing. Previously, indeed, machines had been devised for the carding and shearing of cotton and other cloths, but they were very imperfect in their construction, and so injured the cloths, that they were prohibited by act of parliament, (5 & 6 Edw. 6. cap. 22.) The stocking-frame was invented by Mr. William Lee, a private gentleman, about the year 1589; its value and importance were not at first understood, but the impulse which it gave to trade was sensibly felt before the lapse of half a century. In January 1655 the frame-work knitters formed so large and influential a body, that they petitioned the Lord Protector for a charter of incorporation. This petition was printed at the time, but is now a very scarce document. From a copy preserved in the British Museum, we extract the description of their trade and its origin—

"Which trade is properly styled frame-work knitting, because it is direct and absolute knit-work in the stitches thereof; nothing different therein from the common way of knitting; (not much more anciently for public use practised in this nation than this,) but only in the number of needles, at an instant working in this, more than in the other, by an hundred for one, set into an engine or frame, composed of above two thousand pieces, of smith's, joiner's, and turner's work, after so artificial and exact a manner, that (by the judgment of all beholders) it far excelleth in the ingenuity, curiosity, and subtilty of the invention and contexture, all

* Extracted from a Review of "Some Particulars of the Present State of the Hosiery Trade;" and "Statistics of the Bobbin-net Trade;" by Mr. Felkin, in the Athenæum, No. 536.

other frames or instruments for use in manufacture, in any part of the world . . . . . Now so it is, may it please your Highness, that this trade of frame-work knitting was never known nor practised either here in England, or in any other part of the world, before it was (fifty years past) invented and found out by one William Lee, of Calverton, in the county of Nottingham, gentleman, who by himself and such of his kindred and countryman, as he took unto him for servants, practised the same many years, somewhat imperfectly, in comparison of the exactness it is sithence brought unto by the endeavours of some of these your petitioners."

It appears that one great reason why the frame-work knitters sought a charter of incorporation, was the alarm produced by several efforts to establish the manufacture in foreign countries. Lee, himself, finding that he received no encouragement in England, accepted an invitation from Henry IV. of France, and established himself at Rouen; but after the assassination of that monarch, the new government withdrew its protection, and broke its engagements, and Lee returned to Nottingham, and founded some factories, which were at first supported only by his relations and his tenants.

In the course of a few years frame-work knitting became so profitable, that the Venetian ambassador in England resolved to introduce the manufacture into his native country, and prevailed upon Henry Meade, by a bribe of five hundred pounds, to export his frames and some of his workmen to Venice. It seemed probable, at first, that the experiment would succeed, but Meade soon found that when any accident happened to his machines, it was impossible to get them repaired by Italian artificers, and the cost of sending them to England, or continually bringing out new frames, consumed all his profits. He finally abandoned Italy, and, returning to Nottingham, became the head of a flourishing manufactory.

The attempt to establish frame-work knitting in Holland was even a more remarkable failure. Induced by the large promises of the Dutch government, Abraham Jones opened a factory at Amsterdam, early in the seventeeth century; the city was soon after visited by a plague, which swept away Jones and his family; and the Dutch, not knowing how to use the frames, sent them back to London, where they were sold for a mere trifle.

In 1669 there were about 660 frames in *Britain, which gave* employment to 1,200 *workmen. These frames* were thus distri*buted*:—*400* in London, 50 in Bucks, 50 in Surrey, 100 in Nottingham, 50 in Leicester, and 10 in Dublin. Three-fifths of these made silk goods, but cloth hose continued to be used by the great bulk of the population. The manufacture, however, was rapidly advancing, for in 1695 it appears that there were more than 1500 frames in London alone, and that 400 had been exported during the preceding twenty-five years. The company of frame-work knitters, which had now been for some time incorporated, took alarm at the increasing exportation of frames, and obtained an act of parliament (7 & 8 Will. 3.) prohibiting not only the exporting of knitting machinery, but its removal from one part of England to another, without due notice to the company, under a penalty of 200*l*. fine, and twelve months imprisonment. It deserves to be added to our long list of legel anomalies, that this act remained unrepealed for more than half a century after the company had ceased to exist, and, consequently, after the giving of a legal notice was impossible.

The year 1710 is memorable in the annals of the trade for the first violent dispute between the masters and the workmen. A London manufacturer, named Nicholson, had taken more apprentices than were allowed by the customs of the trade; the operatives insisted that the restrictions should be observed, and, in the progress of the quarrel, more than one hundred frames were broken in the metropolis. A large capital was at this time invested in the trade, the number of frames in Britain being nearly 9,000; parliament, therefore, interfered, and the severest penalties of the law were denounced against frame-breakers.

The Frame-knitters' Company, which had been incorporated in 1664, and had, by charter, a right to make bye-laws and govern the trade in all things, began, in 1726, to aim at forming a monoply. They proposed to establish a joint-stock company for the manufacture and sale of stockings, with the declared intention of regulating and lessening competition, and equalizing the rate of wages. There was a more than ordinary display of stock-jobbihg speculation in the mode of raising the prescribed capital, but the plan was soon found to be anything but lucrative, and it was finally abandoned in 1730. Twenty years afterwards the London Company made its last and most vigorous effort to enforce its exclusive privileges over the whole English trade. An inquiry was instituted before the Houses of Commons as to the state of the trade, and the utility and influence of the chartered body; and a report made against the laws and practices of the company, and in favour of perfect freedom of manufac-

ture. After a brief struggle, the company sunk into insignificance, and finally disappeared.

We have now arrived at the great era of invention in the history of the trade. We shall not attempt to describe the particulars of the several successive processes devised by the ingenuity of the manufacturers, such a task would require a volume of very formidable dimensions, but we may say a few words about their general principles. Great confusion has arisen from the application of the term "weaving" to the stocking manufacture, and of "looms" to the frames: the difference is, however, sufficiently obvious; textile fabrics, whether of silk, cotton, or wool, are composed of continuous threads; chain-work, which includes stockings, lace, and fishing-nets, are formed and connected by a succession of loops; and it is to the accidental discovery of this principle of identity, that England is indebted for the bobbin-net manufactory. It needs scarcely to be added, that the mechanical difficulties to be overcome in chain-work are much greater than those in weaving, and also that there is greater scope for the development of ingenuity; any child playing cat's cradle has a practical knowledge of both facts.

It was in 1730 that cotton was first used in the manufacture of stockings, and at the same time tuck-ribs were invented. From this time there was an active rivalry between the manufacturers of French and English hose, but the foreign goods were generally superior. They particulatly excelled in the beauty of the *clocks*, or insertions in the side of the stockings. A machine, called "the tickler," was added to the stocking-frame, by which the loops were moved in various directions, so as to give the clocks the appearance of rich lace, and this suggested the possibility of directly manufacturing lace in the stocking-frame. Soon afterwards the point-net machine was invented: it was a machine appended to the frame, which made the net without removing the stitches; and this invention, after numerous improvements, nearly superseded the manufacture of silk lace by the hand. This net, though an imitation of bobbin-lace, was yet inferior to it in many essential points, particularly because it did not retain the appearance of lace when unstiffened; but notwithstanding these defects, no less than 1,200 workmen were at one time employed in making it, and more than 20,000 persons in ornamenting the net and preparing it for sale.

In 1759, Jedediah Strutt obtained his *patent for Derby ribs;* and in 1776 Horton *patented his knotted frame*, but still there were many impediments to be overcome. So early as the year 1770, attempts were made to produce bobbin-nets by machinery, in exact imitation of those made by the hand, having the threads traversed and twisted round each other. The nature of the effort is thus described in a Memorial presented to the Lords of the Treasury, a few years ago, by the bobbin-net manufacturers.

"To accomplish this object, a machine was invented to plat a warp at both ends, in imitation of a machine brought from Switzerland, but this was found too slow a process;—hundreds of other experiments were tried, and though the bobbin mesh was by these means effected, yet the want of speed and accuracy of working rendered all the plans abortive. Numerous attempts were made during this period in Scotland, London, and many parts of the kingdom, to make fishing nets by machinery, which was for several years also essayed at Nottingham. A workman employed in making and inventing such machinery, at length discovered, through accidentally seeing a child at play, the formation of the bobbin and carriage now used in the bobbin-net machine, which was first applied to the making of fishing nets. Notwithstanding this discovery, none of the inventors could apply it to a machine to make bobbin-net."

It was not until after the lapse of nearly forty years, that a machine for making bobbin-net was completed; it was brought into work in 1809, but it was found exceedingly complex and slow in its movements, having twenty-four motions to the series for twisting the mesh, and four motions for the pins to secure the twist from unravelling. The memorialists whom we have already quoted, give the following account of the successive improvements.

"This complex machine, before the expiration of the patent, was simplified so as to require only thirteen motions to complete the same mesh, and two to prevent the unravelment; two other improvements reduced the motions to eleven, and two motions for preventing the unravelment; and at length the utmost acme of speed was accomplished, by reducing the motions to six, and performing the two motions to prevent unravelment at the same time that the other motions were made; whilst a number of machines to any extent were constructed, so as to be propelled by steam and water power. The original machine only possessed speed sufficient to make one rack, of 240 holes in length, in an hour, whilst the power-impelled machines can make six such racks in an hour; in addition to which, the

original machines made nets from one yard to one yard and a half in width, whereas machines are now made to fabricate net three and even four yards in width, thus increasing the speed of the machinery *twelve-fold*. * *

"In addition to the improvement upon the principle of the original machines, other modifications of the principle of making bobbin-nets, by the bobbin and carriage, have been accomplished. Though the original machine was only calculated to make plain net in a broad piece, unornamented, yet by the application of unceasing ingenuity, regardless of expense, various ornaments have been worked into the net, by machinery, whilst the net, instead of being made in broad pieces, is worked into slips, exactly imitating the cushion net. The result of making such lace by machinery has been, to reduce the foreign cushion-lace workers to less thon a tenth in number, and England has become a great exporting nation for lace, to the amount of two millions annually, instead of being an importing nation to nearly that amount."

A vast amount of capital was sunk in the trade during the developement of these inventions; out of 5000 machines, the 3,500 first constructed at a cost of two millions sterling, were in the course of a few years, by the progress of improvement alone, depreciated to one-tenth of their value; to say nothing of the number of frames destroyed during the Luddite crusade against machinery in the years 1811-12. The principal machines now used are, the "Rotary," which can be worked by grinding or turning a handle, and of course is usually put to steam or water power: the "Circular," a bobbin-net frame, which must be worked by hand; it is so called, because a certain important part of the inside is circular, which, in another kind, the "Straight Bolt," was made straight; the "Traverse Warp," an exceedingly ingenious contrivance, in which the warp is made to traverse in making the meshes, instead of the bobbin or weft-yarn: finally, the "Lever," in which an eccentric motion is produced by the action, so as to admit of the production of a great variety of pattern. There is a new machine now at work, acted upon by the Jacquard cards, and each thread is rendered, in working, independent of all the others. The results are very striking in the pattern.

We have hinted that the progress of invention was not a little impeded by an ignorant dread of the consequences of machinery in diminishing the demand for labour; and Mr. John Heathcoat, the inventor of the bobbin-net machine, was forced to abandon Nottingham, and he transferred his establishment to Tiverton. * * *

Comparing the state of the trade in 1831 and in 1836, we are struck with the remarkable transfer of machinery, from the town of Nottingham to its vicinity. Within these five years the town has lost 600 machines, which have been removed to the neighbouring villages. We find an extraordinary increase in the manufacture of fancy-net; the machinery for its production has risen from one twenty fifth to one-third of all the machinery employed, and it is probable that this proportion will increase, for Mr. Felkin says, that out of the 3712 machines, respecting which accounts have been received, 165 were standing, probably for the purpose of undergoing such alterations as would fit them for the production of fancy-net. The history of this change is very pithily related by Mr. Felkin :—

"It is worthy of remark, that the depression in prices of bobbin-net in 1833, and the reduction in value of narrow machines, to the price of old iron, forced the progress of invention onwards with unusual rapidity. So complete was the despair in 1833 and 1834, of ever making narrow and slow machinery again profitable, that the writer has account of from 5 to 600 machines then broken up. Many of these were thrown piece-meal out the windows of the upper rooms in which they had been worked into the neighbouring streets, not being thought worth the trouble of carrying down stairs, though they had cost a few years before several hundred pounds a piece, and were still in good working condition. At that time, one of the street cries in Nottingham was 'Old rags and twist (bobbin-net) machines to sell," and many found their way to the iron yards and smiths' shops through this extraordinary channel. The adaptation of this class of machines to the production of new and profitable articles, has prevented any from coming into the market, or being broken up during the past year; and they are scarcely to be bought for tenfold the price they were offered at in 1833. A curious, though certainly an extreme instance of the value of improvement and adaptation has occurred in the alteration of certain traverse warps and levers machinery, the produce from which was previously selling at 3½*d* or 4*d*. a rack, to make articles at a very trifling increase in the prime cost, and which have since currently sold for 3*s*. 6*d*. to 4*s*. a rack. Prior to alteration such machines were only worth from 2*l*. to 10*l*.; an expense of, say, 10*l*. to 20*l*. each having been incurred, they would now readily bring from 50*l*. to 100*l*. a piece, if offered for public sale."

om the same authority we quote an ınt of the results of the change :—

The difference in favour of the trade, in ear 1835, by the transition from mak- lain net and quillings to make fancies, fore may be thus stated :—1000 machines ised, from the value of 2*l*. to 10*l*. each, value of from 50*l*. to 100*l*. each ; 1500 00 able-bodied men are employed beyond could have been engaged in making nets and quillings ; the increasing abundance of the latter articles, and consequently decreasing price, has checked ; 100,000*l*. has been paid in year, for yarn, of which the rotary and circular fancies have been made ; 00,000*l*. additional has been circulated e same time for wages, expenses, and, s, in this department of the trade. demand for fancy goods is gradually ging, and much ingenuity is at work to and improve, as well as to increase the y. The 'Jacquard,' has been recently ed with considerable success to the n-net machine ; and there seems no n to doubt that the various apparatus sary for combining weaving and em- ery with the fabrics hitherto manufac- d upon the bobbin-net frame, will, ere be perfected, and of course generally eneficially employed."

e machinery at work is distributed in ty and employment as follows :—

	Plain.	Quillings.	Fancies	Total.
tingham........	372	1006	784	2162
estershire......	207	37	99	343
yshire..........	192	49	14	255
t of England and of Wight......	654	30	103	787
Total.........	1425	1122	1000	3547

LIGHTING THE HOUSE OF COMMONS.

the Parliamentary Report in the *Times* of Tuesday.)

It was now nearly dark, and the process hting up the house with gas being it became difficult to take notes in the y, not only on account of the absence ht, but the attention of the members ally was diverted from the proceedings house to the novel experiment about tried ; a confused murmur of conver- prevailed, and consequently those ers who rose to address the house at nfavourable period scarcely obtained a g. In order to understand the nature ffect of the experiment, it is necessary te that there are two ceilings to the —the original flat lath and plaster one cted with the roof, and an additional laced some few feet below it, which troduced about eighteen months ago, *several alterations* were made with a *improve the ventilation of the house,* and to assist the hearing. This second ceiling is composed of a wooden framework in three divisions running lengthwise, forming, as it were, three sides of an octagon; the two compartments next to the walls are glazed with ground glass, and equal to the whole length of the building, standing in a slanting position and supporting the third division, which is merely wainscotting, flat, and about the same width as the others. Immediately above the two glazed divisions three gas pipes were placed, being perforated with holes about two or three inches apart, for the purpose of throwing out as many jets of gas, the ascent of which to the height required was not very rapid at first, and the tapers were passed over the apertures several times before ignition took place. This was effected, first of all, at the lower end of the house, directly over the gallery appropriated to the accomodation of "stranger," making them unusually conspicious and observable to every member, in spite of the standing order. The persons engaged in the operation proceeded to the other end of the houss next, and after a few trials succeeded in lighting the gas over the reporters' gallery, from whence the brilliant illumination gradually extended over the whole of the three rows of jets, until the whole house was in a blaze, agreeably with the motion of the hon. member for Finsbury. The effect was charming to the eye ; the light shining through the glazed ceiling, rendering it exceedingly soft and mellow, although twice, or perhaps thrice, as strong as the light given by the candles, which were still mounted in the chandeliers, but not lighted. A great heat, as might have been expected from so much gas burning, is felt by those who sit in the galleries ; and as there is certainly more light than may be required for ordinary purposes, it may be worth while for those who manage the affair to consider whether two rows of gas pipes may not be sufficient for the purpose. As far as we could learn, the experiment gave very great satisfaction to the house."

On the following evening, however, the lighting by wax candles was resumed, in consequence, it is stated, of the great additional expense of the gas.

DR. SPURGIN'S ENDLESS LADDER.

A patent has recently been obtained for a most ingenious and useful machine, adapted to mining and many other purposes, where the main object is to raise or lower weights and packages in constant succession. This simple, but very effectual contrivance, consists of an endless ladder, made either of chain or rope, which passes over and under two revolving drums or cylinders,

mounted upon horizontal axes; one placed at the bottom, and the other at the top, of a shaft or plain, to or from which the ladder is intended to reach. A continuous motion being given to either of the cylinders by the power of steam, or animal force, the endless ropes or chains, furnished with horizontal staves, like those of a common ladder, are made to circulate over the revolving cylinders by which they are extended, so that one part of this endless ladder is continually ascending with a slow but uniform motion from the lowermost of the cylinders to the uppermost, whilst *vice versa*, the other part of the ladder is descending to the lowermost in an uninterrupted circulation. A vast deal of labour is thus unremittingly performed with the important result of great economy in time and power. The invention also provides a safe and easy conveyance for men, the accomplishment of which, in a philanthropic as well as any other point of view, has long been a desideratum in mining operations. For this purpose, a small moveable step or footboard, furnished with a hand rail, is applied, which, if desired, can be made wide enough to admit of several persons standing a-breast, who are, by this means, passed up and down without fatigue, and in perfect security. Independently of the certain advantages that would result from the application of such machinery to the purposes for which it appears so admirably adapted, we consider Dr. Spurgin, of London, (the inventor of this apparatus,) to have thus planned a most admirable contrivance for the poor miners, a numerous class of our fellow-citizens, who, from the peculiar nature of their occupation, are exposed to fearful risks of life and limb, and whose casualties would be materially diminished by the adoption of this machine.—*Mining Journal.*

LIST OF IRISH PATENTS GRANTED IN JANUARY 1838.

John Archbald, of Aloa, Sterling, manufacturer, for improvements in machinery or apparatus for carding wool, and doffing, straightening, piercing, roving and drawing rolls, or cardings of wool.

Godfrey Woone, of Berkley-street, Piccadilly, gent., for an improved method of forming plates, and raised surfaces thereon, for printing impressions of different substances.

Samuel Draper, of Basford, Nottingham, lace-maker, for certain improvements for producing ornamental lace or weaving.

Baron Henry de Bode, Major-General in the Russian Service, of Berners-street, Oxford-street, for improvements in apparatus for retarding and stopping chain and other cables or ropes on board ships or vessels.

NOTES AND NOTICES.

New Method of Breaking Ice.—Much gratification was afforded to many of the inhabitants of Ledbury last week by witnessing the operation on the Herefordshire and Gloucestershire Canal of an ice-breaking boat, lately invented by Mr. Steven Ballard, engineer. Long pieces of timber, cased with iron, were fixed on the front of the boat; these timbers project before the boat, and form an inclined plane, sloping upwards from the under edge of the ice to near the middle of the boat. By these means, when the boat is drawn forwards, the ice is forced upwards instead of downwards, as is the usual way of breaking; and it is found the ice breaks remarkably easy when thus lifted from the water. The boat, with its apparatus, was drawn along the canal by two horses at a brisk pace, and the ice, which was in some places upwards of four inches thick, was ploughed up with great facility. The appearance of the boat when in motion with the large pieces of ice continually rising over the front and falling on the sides, was very pleasing and interesting. Mr. Ballard has practised the method of breaking ice by forcing it upwards for some time past, but never with a boat and apparatus constructed puposely for this method before this winter. It is calculated that one horse will do as much work with a machine of this kind as four in the common way. Several boats loaded with coal were lying ice-bound at Over, near Gloucester, and in other parts of the canal, which were liberated, and followed the ice-boat into the basin of the Ledbury wharf, affording a useful supply of fuel to the inhabitants of the town and neighbourhood at the present inclement season.—*Birmingham Advertiser.*

French Notions of Machinery.—A very droll instance of this kind recently occurred at Havre, to which port an iron garden roller was sent from England, but the gentleman for whom it was imported has been obliged to write to the maker for a certificate of its uses, in consequence, says his letter, of its having been seized by the Custom-house officers, as *une machine sans vapeur, pour la fabrication des aiguilles et des epingles.* We believe it would puzzle even French ingenuity to make needles and pins with a garden roller.—*Literary Gazette.*

Steam Navigation on the Rhone.—The "Eagle Company" (*Compagnie de l'Aigle,*) for the navigation of the Rhone, from Geneva, has met with so much success, that an opposition company is on the point of starting. From the 4th of April, to the 4th of July, the Eagle Company will have four steam-boats in activity, and intend to build as many more as they think likely to pay. Their machines are manufactured by Messrs. Miller, Ravenhill and Company of London, and the building of the steam-boats is under the superintendence of Mr. William Evans, who has just been presented with a gold medal by the Shipwreck Society of Geneva, as a token of acknowledgement for the improvments he has introduced in the construction of steam-boats. It is striking to observe in accounts of the progress of steam navigation abroad, how invariably the names of Englishmen are found to occur. If Italy may boast of supplying Europe with singers, and France of providing the civilized world with cooks, England may no less confidently claim the merit of sending forth her sons to every region of the globe to spread and improve the useful arts of life.

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Mechanics' Magazine,

MUSEUM, REGISTER, JOURNAL, AND GAZETTE

No. 759.] SATURDAY, FEBRUARY 24, 1838. [Price 6*d*.

Fig. 3

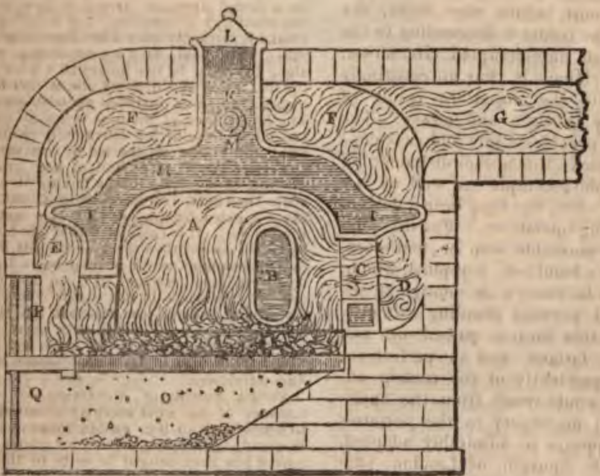
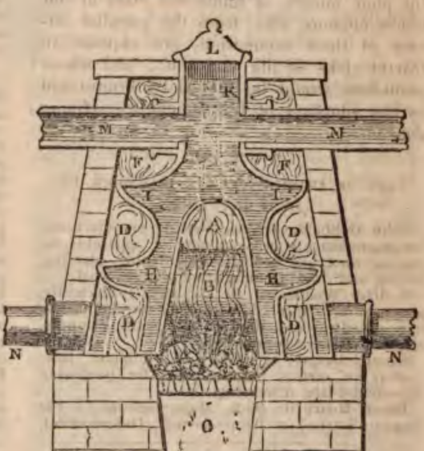


Fig. 2

Fig. 5



PRACTICAL OBSERVATIONS ON THE RELATIVE MERITS OF IRON AND WOOD ROOFS FOR STOVES, GREENHOUSES, &c. &c.; AND ON HEATING BY AIR, STEAM, AND HOT WATER. BY J. THOMSON, LANDSCAPE GARDENER AND NURSERYMAN, CROYDON, SURREY: ALSO, A DESCRIPTION OF HIS ECONOMICAL EGG-SHAPED BOILER.

Sir,—Knowing that a great diversity of opinion exists as to what description of materials are best in the construction of roofs for stoves, greenhouses, and other buildings intended for the culture of fruits, and of tropical and other exotic plants; and, having had for years the management of the extensive ranges of glass at Sion House, Kew, as gardener to the Duke of Northumberland, and at other places where the construction of the frames was both of iron and wood, I am induced to submit to your consideration the result of my practical observations relative to the two descriptions of houses under remark, as a guide to persons intending to make such erections. Having had ten years of practical experience, and the management during that long period of three thousand feet of glass, designed for the culture of fruits and plants, I am enabled to speak with some decision on the subject; and there are hundreds, I doubt not, of practical men who will confirm the truth of the following observations, and agree with me in the decided conviction I entertain of the superiority of wood over iron. I feel fully justified, indeed, in saying, that when the merits of wood and demerits of iron are fully shewn, the erroneous prejudice in favour of the latter will cease to exist in the minds of all candid men.

Every person possessing even a trifling knowledge of the expansion and contraction of all metallic substances, may form some idea of the consequences of the expansion of a large iron-roofed house in a hot summer's day, and of its contraction during a night of severe frost. So powerful have I known the action of the sun's rays to prove in expanding the iron rafters of a large roof and lights on a hot day, that I have found the strength of three men insufficient to force down the sliding lights for the admission of air. In fully equal proportion have I witnessed the contraction of the metal during the intensity of winter, when so large have been the apertures between the rafters and the lights, as to admit the external air in a degree sufficient to counteract entirely the power of two strong fires when the flues have been heated to the greatest excess, and render a considerable time necessary to raise the temperature of the house to three degrees of Fahrenheit; the thermometer then standing (out of doors) at 18 degrees of frost. This was in February 1830. Now this occurrence took place in a house of no very large dimensions compared with the wood-roofed I shall afterwards describe; its dimensions were 40 feet long by 16 wide, and 9 feet high, with a pit in the middle for the culture of pines, &c., which very much reduced the number of cubical feet of air to be rarified, compared with the wood roofed house, which was 50 feet long, 14 wide, and 14 high, without any pit in the middle. Having stated the dimensions of the houses, I shall now give the result of the investigations and calculations made relative to fuel, attention, &c.

The coals for both houses were measured before being placed for use, and after the consumption of the night's fuel, the result was as follows: The iron roofed house, with 18 degrees of frost, required the consumption of nearly 6 bushels of coals, and unremitting attention during the night and until 3 o'clock in the morning; while the house with the wooden roof consumed scarcely 3 bushels of fuel in order to keep it at the same degree of temperature as its iron rival, and no attention was required after 10 or 11 o'clock at night, when the fires were made up and left. Not satisfied with this, but being determined to investigate thoroughly the merits of the two materials in every point of view, I caused a house constructed of wood, and also one of iron, both of precisely the same dimensions, as regarded superficial feet of glass, to be perfectly repaired in the autumn of 1832. On having them examined and repaired in the following season, I found that the cost of repairing the iron house was nearly double the sum required to repair the wood. I do not mean to say that double the number of squares were absolutely broken, but including the broken and cracked squares, there was more than double the number destroyed,

Fig. 1

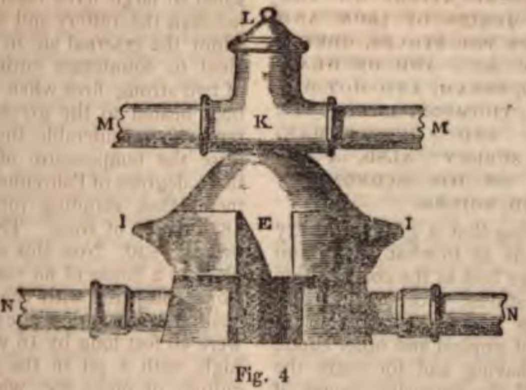
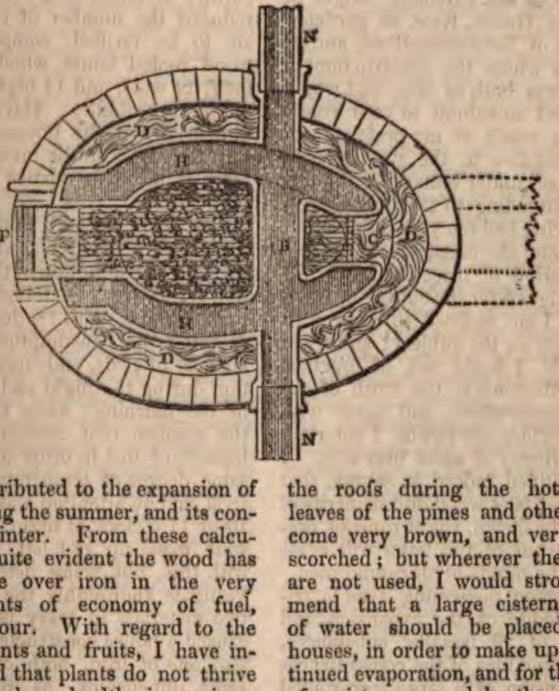


Fig. 4



and this I attributed to the expansion of the iron during the summer, and its contraction in winter. From these calculations it is quite evident the wood has the advantage over iron in the very essential points of economy of fuel, glass, and labour. With regard to the growth of plants and fruits, I have invariably found that plants do not thrive so well, nor look so healthy in an iron, as in a wood-roofed, house. The non-conducting power of wood and the electrical (may I say calorific) sensibilities of iron may be the cause of this difference. Iron is infinitely more liable than wood to sudden and injurious extremes of temperature. I have always found during my practice, that no matter how the iron hot-house might be situated, unless there was a slight shading on the roofs during the hot days, the leaves of the pines and other plants become very brown, and very frequently scorched; but wherever these shadings are not used, I would strongly recommend that a large cistern or trough of water should be placed about the houses, in order to make up for the continued evaporation, and for the deficiency of moisture caused by the powerful action of the sun. One important circumstance which is worthy the gardener's attention, is, that iron houses should be painted internally, either annually, or biennally at the farthest, to prevent the drip from the corroded iron injuring the foliage, for I have always found this ocherous deposit injurious to the leaves of plants.

My observations continued in the season of 1834 fully confirm the accuracy of my previous calculations. By working two houses at the same temperature, 55° to 60° of Fahrenheit; the result was as follows. The wood roofed house consumed only 1½ bushels, while the iron burnt from 2¾ to 3 bushels every night. This last experiment was made two months later in the season than when my attention was directed to the subject before; but then you will see it bears the same proportions as to fuel, &c. The dimensions of the houses were as follows: the wood roofed, 50 ft. long, 14 wide, and 14 high; the iron, 50 ft. long, 16 wide, and 12 high. The latter was a vinery and had a pit in it for the culture of pines, which, as in the former experiment, very much reduced the number of cubic feet of air to be heated, as compared with the wood roofed, which was for the culture of peaches, and which had no pit in the centre.

The whole of my observations and calculations are unfavourable to iron roofs. I am willing to admit that for lightness and neatness of appearance in the structure, iron has, and will always have, the advantage; but still I am confident, that if proper attention were paid to the construction of hot-houses, and to the materials used in their erection, the appearance of a wood-roofed house would not be altogether objectionable.

Now, for the assistance of persons building houses for horticultural purposes who may have had less practical experience than myself, I will proceed here to give a brief description of such materials, and of the modes of construction which, I think, will combine the whole of the desired objects.

The first thing to be attended to is to give the roof a proper pitch or inclination, so as effectually to carry off the water and prevent drip in the house, which is highly injurious to plants in pots. Secondly, to form the roof in the following manner: the rafters to be of wood varying according to the length of the roof, from 6 to 11 inches; the section of the rafter to be wedge-shaped from 3 to 4 inches wide on the upper, and about half an inch wide on the under side. *The ends and sides of the light to be made of wood; the top from 4 to 5 inches, the sides 2½ inches, and the bottom from 5 to 6 inches wide.* The sash bars, to prevent as much as possible the obstruction of the sun's rays, should be of copper, which will give the house a light and neat appearance, and yet not subject the plants to injurious extremes of temperature, as the small quantity of metal in the thin sash bars, which need not be more than half an inch wide, and about the same deep, will cause but very little variation in the temperature by radiation, and suffer little expansion and contraction. Neither would it increase the expense of the light in any great degree over one made of wood; for as copper of that dimension would not weigh more than six ounces to the lineal foot, I should suppose it could be bought for about 1s. 8d. per pound; the expense would therefore be trifling when compared with the advantages, and indeed the extra expense would be repaid in a few years by the saving of wood in repairing the lights; as glaziers cannot hack out old putty without destroying the sash bar; and this being frequently done (as is necessary when lights are kept constantly in use) very soon lessens the substance. I therefore recommend all persons when erecting forcing and other houses, to have them constructed of the above materials, particularly if they are desirous of excelling in the culture of fruits and plants, as by the use of copper sash bars they obtain all the desired objects, namely, lightness of appearance, economy of fuel, glass, and labour. I would further suggest that every gentleman before erecting or deciding on any particular plan or dimensions for a house or houses for horticultural purposes, should consult his own gardener, or some other practical man acquainted with the subject; as it is impossible for every architect or surveyor to know the proper dimensions and elevations of a hot-house to answer all the purposes to which they are appropriated so well as the gardener. It is true that an architect may make a very interesting external drawing, which to the eye appears perfection, but which will, perhaps, never answer any one of the desired ends. Convenience as regards walks, or paths, bark or tan beds, stages, flues (or other manner of heating), cistern for water, ventilation, and innumerable other little requisites and necessaries for a stove, greenhouse or conservatory, may be overlooked, in a

design by one not intimately acquainted with the subject. Every gentleman who goes to the expense of erections of this description, expects in due time to have a return for his outlay in fruit, or the satisfaction of extraordinarily fine individual specimens, or in a general display of flowers; and should he eventually be disappointed of these anticipated gratifications through the bad construction of his house or houses, I regret to say it too frequently occurs, that the fault is thrown on the industrious, persevering, able, and anxious gardener, who is blamed for neglect of duty or a want of skill, not only by his employer, but by others equally unacquainted with the cause; when upon examination of the house by a competent and practical man, it generally turns out that the blame and ill-success are attributable to its formation and aspect. Various genera and species of plants require peculiar treatment and various situations, so that had the gardener been consulted as to the height of the stages, depth, and width of tan bed, and proper situation, for the flues (or other mode of heating), all this disappointment to the employer and the employed would have been prevented. Moreover, it too frequently happens in these "pretty" plans, prepared by non-practical men, that there is an insufficiency of means for the proper ventilation of houses; and want of ventilation in iron curvilinear roofs is frequently attended with the most disastrous consequences. As a confirmation of the correctness of my observations and of the importance of proper ventilation, and of plants being always liable to be scorched under an iron-roofed house, I may state that I remember witnessing last summer the destruction of the whole of a fine crop of grapes, as well as of the foliage, when nearly full swelled, in a gentleman's hothouse in Kent, which was erected of cast iron about six years ago. The destruction occurred through the architect's failing to allow proper ventilation. To prevent the second house of grapes, which had then suffered severely, sharing the same melancholy fate, the gardener (who is admitted to be as good a practical man *as any in the kingdom*) caused some *holes to be made in the* back wall of the *house about 1 foot* wide and 3 long, *where he introduced* shutters hung on hinges, by which means he fortunately succeeded in saving the second house of fruit, but not without great injury to the foliage. This circumstance was generally known in the neighbourhood of Sevenoaks, and observed by many practical gardeners, who can vouch for the accuracy of this statement.

Having, I think, fully shown the advantages possessed by wood over cast iron in the very essential points of the better growth of plants, and the saving of fuel, glass, and labour, I shall now add a few words on the various systems of heating houses; that is to say, with common flues, with steam, and by the circumvolution of hot water. The last named method is now become very general, and is admitted by all scientific men to be the best, because it is the safest, the most certain, and no doubt, when properly fitted up on a good principle, it is also the most economical as regards the expenditure of fuel and the application of labour. Entering on this all-important subject, therefore, I shall confine my observations in the first place to the advantages of hot water over steam, which are (in my opinion) many and very great, particularly where coals are expensive. To generate steam an enormous consumption of coals or oven coke, (which is nearly as expensive,) is indispensably required, as a weaker fuel will be found of no avail. This is the first evil of the steam system, and the second is, that a man's time must be nearly, if not wholly, employed in affording that constant attention which is necessary to keep up the fire. Then, in the third place, there is considerable loss of time, and not only of time, but of fuel, before the pipes become filled with steam. This is a very important fact, to which, perhaps, due attention has not been paid; for it may not be generally known that steam travels through the pipes in a time no shorter than it requires to make them nearly as hot as itself; for steam, the instant that it comes in contact with a body colder than itself, becomes condensed, and its onward motion is of course impeded. Again, the moment the fire becomes too weak to keep the water at the boiling point, so that steam may be generated, it immediately ceases to furnish heat to the pipes consequently, they soon become cold; and this is the fourth evil of

heating by steam, which is avoided by the use of hot water; for the instant the fire is ignited, and the water gets warm, the particles of the fluid are set in motion, circulation in pipes commences, and continues until the whole of the fuel is consumed, or so long as there remains any heat in the furnace, in the bricks, or in the boiler. Still further, I have proved that two pipes, each 4 inches in diameter, the one filled with water at a heat of 200 degrees, and the other with steam, the one with hot water would contain a much greater and more enduring body of heat than the one filled with steam; and I have no doubt that if, when both pipes were heated up to the stated temperature, the fires were allowed to expire, the pipe containing steam would cool as much in one hour as the hot water pipe would in six or seven hours. These are facts stated from accurate observation, frequently repeated, and from exact calculation, very severely tested; they may, therefore, be considered to demonstrate, in the last place, the decided advantages which the plan of heating by the circumvolution of hot water possesses over the rival system of heating by the diffusion of vapour.

To the superiority of the hot water plan as to economy both of fuel and labour, I may be allowed to bear witness, for during the last 15 years I have devoted the best energies of my life to the subject. Throughout that period I worked four steam boilers, and had under my own eye the direction and application of no fewer than six of the most approved systems for raising temperature by means of hot water. This extensive experience and the opportunities it afforded of drawing an impartial judgment on the merits and defects of all the different systems, added to a natural taste for, and love of, experiment, directed me to the construction of my economical egg-shaped wrought iron boiler, which has not only received the direct approbation of every engineer who has witnessed its operation, but is considered by them and by all who have adopted it, as the most simple and economical of all the plans yet submitted to the public. So confident am I in its superiority, that I always offer a guarantee to all who *employ me to fix* it, that I will keep it in *repair, and* take the responsibility of its *acting properly* for three years, provided that it be fairly used. On such conditions, those who favour my invention cannot run much risk, nor entertain any apprehensions as to its efficacy, for surely three years will afford them ample time to decide upon its merits and advantages. Its chief features are its expanse of surface and the economy of its arrangements.

Aware as I am that any information from practical men explanatory of the cause of improper working in so many hot water apparatus will be acceptable to all gardeners who have the management of them, and who peruse your truly valuable publication, I will briefly state a few of the principal causes to which failures are attributable. No one is more difficult to be overcome by persons unacquainted with the hydrodynamic principles on which the action of the hot water is regulated, than the accumulation of air in the pipes. Indeed, unless proper arrangements are made for the escape of the air which is evolved from the water when at a boiling point, no apparatus can act properly. Now, from some accidental cause, even in the best constructed apparatus, this air may collect and lodge in the corners or angles of the pipes, particularly when they have to rise and fall; this should be particularly attended to, as the want of due regard to necessary precaution in this particular, is, in my opinion, the principal cause of the many failures with hot water, and the reason why this description of apparatus is sometimes spoken of unfavourably; for I have invariably found from practical experience, that water will not circulate beyond the point where there is an accumulation of air; and, the more powerful are the attempts made to remove the obstruction by increasing the strength of the fire, the more likely is the apparatus to work improperly and to cause an overflow of water in the supply cistern. Therefore, as soon as it is discovered by the gardener or person having the management of the fire, that the water does not circulate regularly, he should trace the water, by its warmth, along the pipes to the place where he finds the metal cold; and then in the bend or angle, should he not find an air tap, I should recommend him to procure a blacksmith's drill, and to have a hole made in the pipe, when he will find the air to pass off rapidly,

and the water follow instantly. Then, should he not be prepared with an air pipe, a small wooden plug would suffice until an opportunity offers to fix a pipe properly, as in all propability it might be many months, and perhaps years if the cistern be carefully and continually attended to, before such an accident would occur again at that particular joint or bend. I would, however, strongly recommend that in every apparatus ample provision should be made for the escape of the air at every bend where it is likely to collect or lodge, for I have witnessed, during the time I had the management of six systems of hot water, that from some unknown cause, an apparatus which had worked properly for one or two years, would suddenly get out of order, when on tracing the pipe as before described, as far as I found it warm, I have then, on drilling a hole at the first turn beyond where the pipes began to feel cold, found an accumulation of hydrogen and carbonic acid gas, the heaviest of all the gases, lodged in the angle; as soon as this was allowed to escape, the apparatus worked as regularly as usual. To remove this difficulty, which to persons unacquainted with the cause of the obstruction, would appear formidable, nay, almost insurmountable, not more than ten minutes' space was sacrificed; and, on interrogating the man who had the management, as to whether he had allowed the water in the cistern to fall below its proper level, I discovered that the derangement had been caused through his negligence and inattention in having suffered the water to sink below the level of the top pipes, which of course left a place for this foul air. I would, therefore, advise all persons, when not using the apparatus, either to draw the whole of the water off, or to keep the cistern as full as when in use: this precaution would prevent the air from collecting; but when the boiler is filled again, they should be careful to leave the air taps open, until the water begins to flow out, or till the boiler is full, to prevent a repetition of the inconvenience.

There is also another highly important arrangement connected with hot water apparatus — a property of the metals, which should be attended to with great care. I mean the allowing *of a sufficient longitudinal* expansion for the pipes on their becoming hot; as it should be borne in mind, that, iron pipes when heated to 200 degrees will expand nearly 2 inches in a length of 100 feet. As a proof of the necessity of attending to this fact, I may relate a circumstance that fell under my own observation.

A few years ago, a nobleman's conservatory in Hampshire, was heated with hot water at an expense of between 300 and 400 pounds, and the pipes from the boiler were introduced through the stone that formed the foot path, in which holes were cut, just large enough to admit a 4 inch pipe, but not of sufficient diameter to allow for the expansion of metal. I well remember that in consequence of this oversight, in 14 or 15 different situations where the pipes had to pass through the stone, the joints burst. In each of the 80 feet lengths of pipe which amounted to about 7 or 8 lengths altogether, one third of their joints burst after it had been used only 3 or 4 times. At intervals the same mischief occurs, to this hour, and will do so until they allow room for the expansion of the pipes where they pass through the stone.

Having thus given a few brief instructions for the management of hot water apparatus, and knowing there exists a great diversity of opinion relative to the quantity of water a boiler should contain, and of the dimensions of the waterway in both pipes and boiler, so as to secure a regular and lasting temperature, I hope it will not be considered presumption in me to offer a few observations on that subject and leave the impartial reader to decide the question.

It is natural that every constructor of hot water apparatus should be prejudiced in favour of his own peculiar plan; hence it is that the prescribed dimensions of the conducting pipes vary from ½-inch to 5 or 6 inches in diameter according to different plans of different individuals. I shall merely give my judgment of the proper sizes without commenting on any particular plan. A hot water apparatus to answer all the desired purposes to which it is applied, should be so constructed as to avoid either objectionable extreme; therefore, pipes of too large or of too small dimensions are equally to be avoided; and this for reasons which I could easily adduce were it not that I

desire on this occasion to confine my remarks to boilers formed of a series of pipes varying from half an inch to 2 inches in diameter, which I admit have one advantage over boilers containing larger bodies of water, inasmuch as they become hot much more quickly. But then it must be recollected, that the larger body when once heated will remain hot twice or three times as long as the smaller. And I have proved by observation that a 4-inch pipe which contains more than three times the quantity of water that a 2 inch pipe is capable of receiving in a house of the same temperature will retain its heat for more than double the length of time. Moreover, when boilers are used that have such small water-way and small pipes, they require more attention and cannot be left at night with the safety as boilers and pipes containing larger bodies of water, seeing that the former cools so much more rapidly than the latter. Nevertheless, to err in the other extreme, by having boilers and pipes to contain very large quantities of water, would be a great waste of fuel and and by no means calculated to answer to the satisfaction of all parties, so well as a boiler and pipes of medium size. It is my opinion, therefore, that in neither boiler nor pipes, should the water way be less than 3 inches, nor more than 4 inches; and the boiler should be so constructed without complication as to expose the greatest possible surface to the action of the fire. By this means also, an opportunity is afforded of heating several houses, at the same, or very little more, expense. This I have always considered of the greatest importance, particularly when a gentleman's establishment is situated at a great distance from coal mines. In all my arrangements with hot water, I have contrived to have the body of water in the pipes which run through the house, as it is there that the gardener requires a permanent and lasting heat; this it is that induces me to advocate the use of three inch and four inch pipes. There are great objections to the use of small pipes varying from half an inch to 2 inches, particularly when the boiler, is as the plan of some, formed of a series of *pipes; in such* case their interior becomes *in course of time "furred"* up from the *incrustation formed* from the deposition *of the* various earthy matters held in solution by the water, the accumulation of which in time closes up the water-way.

I have thus freely expressed my opinion on the demerits of pipes of small calibre; but it must not be thence inferred that I shall err on the other extreme. For, if boilers and pipes capable of containing unnecessarily large quantities of water are used, there will be a great waste of fuel before any heat is communicated to the house; and, perhaps, a valuable crop of fruit or plants may be destroyed through the gardener not having a proper command of heat, to prepare against the alterations in the weather so common in this changeable and uncertain climate. I have found in the course of my experience and observation, that in the months of October, November, and December more especially, and with less frequency at all periods of the year, that up to the hour of 12 o'clock at night, rain may fall in torrents, and the gardener therefore naturally conclude that during the night no fires will be required either for the greenhouses or conservatory, but how great must be his trouble and surprise to find in the morning eight or perhaps, ten degrees of frost! Now, this trouble and inconvenience I have frequently experienced; therefore, for the benefit of all parties, I beg to repeat here the opinion I have already given, that boilers of a medium size, with water-ways not less in any part than 3 inches, nor more than 4 inches, will be necessary to give the gardener a sufficient command of heat, and afford him an opportunity of protecting the perishable property entrusted to his care.

I shall, in concluding these observations, offer a few suggestions relative to the formation of the furnace and the apparatus generally. First, in all hot water apparatus, there must be a proper sized furnace door; it should not be less than 1 foot square, for the convenience of cleaning out, lighting and making up of the fire the last thing at night; for it is impossible for any man to manage a fire properly with furnace doors such as are used in some hot water apparatus, not exceeding six or eight inches square; but if a good sized furnance door is used, the gardener is enabled in counties where coals are dear and wood plentiful, to burn logs of wood, or the refuse from the pruning of trees, &c., when he only

wants a little fire through the day; but, of course, it must be understood, that this description of fuel is not to be depended on in severe weather, nor for making up of fires for the night. Whatever description of fuel is used, however, I have always found a great saving to be the result of having a moderately large furnace door. Great attention should be paid to its formation, in order to prevent the passage of air through the door way between the boiler and the fire, the neglect of which causes a great waste of heat, as a current of cold air admitted between the boiler and fire through the door way, has a tendency to counteract the power of the fire: further to obviate which, I invariably recommend double doors being used; and then if the boiler is so constructed and set as to expose (which is the great secret in the formation of all boilers), a large surface to the action of the fire by means of the construction of the flues round it, and thus entirely to consume the whole of the gases and carbon before it escapes into the chimney, the greater will be the saving of fuel, and the more powerful and effective the operation of the apparatus altogether. Indeed, I have no hesitation in saying, that if a proper quantity of pipe is used to give a sufficient quantity of surface for the command of the heat required in all extremes of weather, and the furnace, boiler, and if flues beconstructed as suggested, the fire might be made up and left without the least risk for 6 or 8 hours, on the severest nights.

In the formation of the egg-shaped wrought-iron boiler, my attention was particularly directed to the construction of a furnace that would obviate the evils complained of in most hot water apparatus; I mean the great consumption of fuel, and the almost constant attention required, all of which arise from badly constructed fire-places and boilers; but, there are several other circumstances connected with hot water which I think highly necessary to be attended to, particularly when the boilers are formed of series of pipes varying from half an inch to two inches in diameter. In the first place, on no account should dirty water be used, as it causes a settlement or accumulation *of mud, which in time* not *only injures the boiler, but lessens* its power, as well by preventing the fire from acting immediately on the water as by the accumulated deposit impeding the circulation of the fluid by diminishing the calibre of the water-way; and it ultimately forms a hard incrustation, similar to what is seen on the bottoms of steam boilers, and frequently ends by burning a hole in the bottom. Sometimes in order to save a little trouble, when hard water is more conveniently obtained than soft or rain water, the boiler is filled with hard water which is as injurious as mud; for, in the evaporation considerable quantities of earthy particles are deposited at the bottom. I have on several occasions examined boilers that had been taken down after being in use ten or more years, and where this important point had been properly attended to, there has scarcely been an appearance of incrustation. Moreover in all plans of boilers, there should be a small cock so placed as so draw the whole of the water off occasionslly, for the purpose of cleaning the boiler. By the use of rain, or if convenient, filtered or distilled, water, all this difficulty is overcome.

There is also another difficulty attending the use of hot-water, which arises when water has to descend under doorways, &c., or to dip below the level of the bottom of the boiler. I have frequently known plans, good in themselves, prove of no service in the cases described; nay, it has even been found necessary to remove them, in consequence of the water not circulating under the paths and other situations where it was necessary to descend and rise again. All this might be avoided by giving the flow pipe a proper ascension when leaving the boiler, and by having the reservoir or cistern sufficiently high, so as to counteract the power of the water in the return pipes. I was sent for last spring to remove an apparatus in a lady's greenhouse at Westerham in Kent, which could never be brought to act under the door-way; and I succeeded, very much to the satisfaction of the lady, in causing the water to descend in both flow and return pipes to more than two feet below the level of the bottom of the boiler, after which it had to rise again to above the level of the top of the boiler.

In concluding these few practical instructions on the relative properties of common flues, steam, and hot water, I

shall merely state that during my practice, I have always considered hot water a much more congenial heat to plants, and all other organized bodies, whether belonging to the vegetable or animal kingdom, than air, from its close analogy to their natural heat, and the circumstance of its containing less of the noxious gases which not only escape from the surface of the air flue, but from fissures, however well the flues may be built. Moreover, as the temperature of hot water pipes is more equal than that of a flue at both extremities, and rarely exceeds 200 degrees, there is not that exhaustion of aqueous or humid vapour, which is so essentially necessary to the very existence, much more to the health and fruitfulness of all plants, whether natives of torid or frigid climates. Nothing can tend more to the injury of plants, and to the generating of insects, than an arid atmosphere highly charged with unwholesome and extraneous gases. It is only just to infer, that a flue which is continally destroying by its dry heat the very vitals of all plants, namely the humidity of the air in which they are growing, as well as evolving the disagreeable smell so common to flues when hot, (which arises from the decomposition of the animal and vegetable particles continually floating in the air,) cannot be so congenial to the vegetable kingdom as a mild, gentle, and regular heat, such as is produced by hot water, unattended by the noxious gases given out from the smoke, the soot, lime, and bricks, of a common hot house flue.

I remain, Sir,

Yours, &c.

J. W. THOMPSON.

Description of the Engravings.—Fig. 1 is an elevation of the front of the boiler; fig. 2, a transverse section of the boiler and furnace; fig. 3, a longitudinal section through the centre; fig. 4, a plan of the furnace and lower part of the boiler; fig. 5 is a transverse section of a boiler, with an additional flue surrounding the lower part, intended for extensive hot-houses. The boilers are oval shaped (as will be seen by the plan), and would be sufficient to heat seven or eight hundred feet of 4 inch pipe at a trifling *cost for fuel.* The same letters refer to *similar parts* in each figure. A is the *furnace in which* the fuel is placed, entirely surrounded (except the under side) with the boiler; B is the check-draft over which the heat, flame, and smoke passes to a small aperture C, in the back of the boiler, communicating with the flues D, surrounding the lower part, which unite and pass through an opening E, on each side of the furnace-door, to the flue F, which surrounds the upper part, and terminates at the brick flue G, furnished witha damper to regulate the draft. The boiler, H, is in the form of an egg on the plan, with a chamber all round, connected by the check-draft B, and surrounded with flayr, or cover to flue I, with an iron cap L, either fixd or loose, as may be required: M M are two outlet pipes communicating with the upper part of the boiler through which the hot water circulates after passing to the outside of the brickwork. These pipes are ramified into two or three branches, as may be required for warming different houses in separate parts of the building. N N are two return pipes which enter the lower part of the boiler. O is the ash pit, with a door Q to regulate the draft. The furnace has double doors P to exclude the external air.

In the furnace-door used to my apparatus, between the door and the fire, I have placed a piece of iron 1 foot 3 inches long, by 1 foot wide, which acts as a carbonizing plate. When the fire begins to burn strong so as to heat the iron, nearly the whole of the smoke is consumed.

In addition to what I have before stated I may further observe, that during the severest part of last winter all the houses I have heated with this plan of boiler, were kept up to their respective temperatures without burning a bushel of coals, the only fuel used being small coke. During the intense night of Friday, January 19th, when the thermometer stood, at a quarter past six o'clock in the morning, at 12 degrees below zero, we had not the least difficulty in keeping every house, both stoves and greenhouses, at their usual temperatures. From accurate calculations made of the number of feet of surface of glass exposed to the weather, I am enabled from watching the thermometers, both out of doors, and in the houses, with all extremes of temperature, to calculate most correctly the number of feet of surface

of pipe required to command (even with 42 degrees of frost) any given degree of heat required. The want of this practical knowledge of the necessary radiating surface, has been the cause of many complaints against the system of heating by the circumvolution of hot water, all of which would have been prevented had the fixers devoted a few nights during frosty weather to this indispensably necessary point. Neither are observations made during a calm night of severe frost sufficient, for I have found that 16 degrees of frost with a strong north-east wind, is more trying to houses than even the severe night frost on Friday, Jan. 19. The statement I have made of the low temperature at Norwood, may be relied on as I sat up the whole of the night to make my observations and calculations, and may, perhaps, interest some of your numerous readers.

WHITWORTH'S PATENT SCREWSTOCK.

Sir,—In No. 757, your intelligent correspondent, Mr. Baddeley, has ably described an ingenious screw-stock, which is characterized as a most valuable improvement of that useful tool. It is quite true, that, from its construction it admits of very nice adjustment, and is calculated to cut much more keenly than the ordinary die, which entails considerable labour by its close embrace of the metal operated on: but from the performance of a *precisely* similar machine, constructed about twenty years since by Rennie, for screw-cutting by steam power, it is found, that unless great care is observed in fitting the cutters, the thread is liable to be stripped or otherwise injured: and moreover, when either of the cutters happen to be broken, the whole three will most likely be rendered unfit for cutting screws of the *same size* when repaired, on account of the limited range of the eccentric arcs, or revolving planes.

The principle, certainly admits of a very neat application as a universal chuck, but, the right and left-handed screw-chuck is, in my opinion, much more simple and economic.

NAUTICS.

Woolwich, Feb. 19, 1838.

PARLIAMENTARY REPORT ON THE ROYAL MINT.

The labours of the House of Commons' Committee for inquiring into the state of the Mint, were, in common with those of most of the parliamentary committees of last session, cut short previous to their completion by the demise of his late Majesty. The actual "Report," therefore, in the present instance, consists of a few lines only, briefly stating what progress has been made, and recommending the resumption of the inquiry at the earliest possible period. The main body of the volume is composed of the minutes of the evidence adduced, with a pretty considerable addition in the shape of an "appendix" of documents and tables. Of these the evidence forms by far the more interesting portion. That already taken refers to every department of the Mint except those of the engraver and of the solicitor; neither of these officers has yet been examined, but the testimony of some of the witnesses who have already undergone the ordeal, throws considerable light on the state of the engraving department: a light, also, of a very striking character.

It appears that the present chief engraver is the well-known artist, Mr. William Wyon, who receives for his services, a salary of 350*l.* per annum, together with a residence, and the privilege of employing his talents at all times when not required by his public duties. This remuneration will not, perhaps, be considered very extravagant, especially as it appears that former chief engravers have always received 500*l.* per annum, and similar advantages. There is another artist, however, on the establishment, whose position is rather singular, and his emolument not so clearly well deserved. This is a Signor Pistrucci, who is denominated "chief medallist," and who receives a salary of 300*l.* per annum, with equal, or rather superior privileges to Mr. Wyon, although for rather lighter labour. For the last fourteen years, it would appear, the Signor has pocketed his salary, and occupied his suite of apartments without performing any duties whatever! The witness in whose evidence this fact comes out, labours hard to establish as good a case as he can for Pistrucci and his patrons, but after all he is compelled to admit

that all the Signor can possibly be said to have done within the time has been to engrave part of an *unfinished* medal of an inferior description; and that even the coronation medal of William the Fourth was executed by the chief engraver, and not by this most active of "chief medallists." The medal begun upon, ought certainly to be an unique specimen of art when it is finished, since it has already cost the nation at least four thousand two hundred prounds!

It appears that Signor Pistrucci was invited over from Italy, when Lord Maryborough was Master of the Mint, to lend his assistance in preparing the dies for the new coinage then about to be issued. It was held as a matter of course, that there could not be sufficient talent among the engravers of Great Britain itself, for the due execution of the task, and that, therefore, a foreigner must be secured at all hazards. And what has been the result? A new coinage appeared, not particularly remarkable for its excellence in design or execution, but exceedingly remarkable for the unprecedented prominence given by himself, we presume, to the name of the artist. While the style and titles of his majesty were obliged to be represented by curtailments and initials, the name "P-i-s-t-r-u-c-c-i" figured at full length in a conspicuous situation on *both sides* of the coin; as though it were desired to proclaim to all the world that England was compelled to search the continent for an artist capable of fitly executing her coinage, and that none such was to be found within "the four seas of Britain." Signor Pistrucci, it appears, conferred these great favours on the pledge of Lord Maryborough, that he should succeed to the chief engravership on the first opportunity; but when this opportunity occurred it turned out that in making his promise, the Master of the Mint had proved himself grossly ignorant of the powers of his office, inasmuch as an act of parliament stood directly in the way of the appointment, by which it was enacted, that no foreigner should have possession of the dies belonging to the coinage of the kingdom; without which possession the chief engraver could not possibly perform his duties. The consequence has been, that ever since, Signor Pistrucci has resided in the Mint, with the nominal appointment of chief medallist, and the (by no means nominal) salary of 300*l.* a-year. It will have been perceived that in this period he has had nothing to do with engraving either coins or medals, yet we have had both,—and those executed too, in a style far superior to the productions of this Italian artist. How is this? Has the continent again been ransacked? Has another first-rate engraver been decoyed from Italy to this land of fog, there to pine away after a time, on a fat salary and the *dolce far niente?* No such thing! The matter was settled simply enough; Mr. William Wyon was appointed chief engraver, and has ever since performed all its duties in person, the only perceptible difference in the coin since it has been under the superintendance of a native artist, having been a very considerable improvement in point both of design and execution, and the dwindling of the engraver's name from the full-length and *alto-relievo* stateliness of the Italian, to the scarcely-visible "W. W." of the Englishman.

It is plain from all this, that Lord Maryborough might have spared himself the trouble of his Italian importation, and it is equally plain, that had he so spared himself, he would have spared John Bull the honour and glory of supporting a thankless sinecurist in the person of Signor Pistrucci; for, after all, it appears that the Signor considers himself an ill-used man, and repels all insinuations that he might do *something* for his salary by observing that when the British government fulfil their promises to him, he shall have no objection to do something for the British government. That he is determined fully to maintain his rights, may be inferred from the fact of his having lost no time in taking possession of the apartments appropriated to the former chief engraver, which he has ever since continued to occupy, so that, as Mr. Wyon complains, he is compelled to carry on the engraving of the dies in a smaller and more inconvenient space than any of his predecessors, while the dies themselves are more than ever subject to be lost or injured. It is indeed, admitted, on all hands, that the present arrangements as to the dies requires a thorough reform. They undergo so many removals during the various processes they have to undergo, that it is more owing to good fortune than good manage-

that many of them have not dis-
ered, and, that some private manu-
rers are not enabled to turn out a
ge undistinguishable from that of
lint itself! The clerk of the irons,
r whose superintendance they are
l, informs the committee that at
nt, "the dies are forged and burned
ne place, brought up from the
nes and annealed, hardened, and
in another, polished in a third,
ed in a fourth, and submitted to
nspection of the chief engraver in a
department."

e necessary consequence of this
of affairs is, that the dies, on
n so much depends, are continually
ng and re-passing from one part of
Mint to another, often in careless,
perhaps not over-honest, hands.
engraver also complains that the
produced is in a great measure to
ve them from under his supervision
processes they undergo at a dis-
from his department. Altogether
tistical accommodation at the Mint
rs to be very defective: it is pro-
. to improve it by erecting work-
in one spot, where the whole of
reparation of the dies might be car-
n, and where also sufficient space
t be set apart for a large room in
n the present series of dies, and
of former coinages still preserved,
; be exhibited to the public. This
ne at Paris, at Amsterdam, and
other foreign mints, but has never
in the least degree attempted in
on. The collection of ancient dies,
n at Paris is very large and interest-
s here, it seems, extremely meagre;
even the few there are, never see
ght, but are kept in an unarranged
in the Board Room of the Mint,
s there is no convenience for their
ition, even if such a measure were
ed upon. Mr. Brande, the emi-
chemist, who fills the situation of
rk of the Irons," is of opinion that
re were room, the necessary ar-
ments could easily be made, and,
much to his credit, seems disposed
ve every facility in his power to the
tion of the plan. Why not set
: it at once, and appoint Signor
ucci "chief exhibitor," by way of
ng him something to do. It might
well, perhaps, as constituting him
ead of a *National School* of De-
sign, as suggested by one of the witnesses: but we doubt whether the Signor would deign to accept of either situation.

The mechanical departments of the Mint appear to be in a more satisfactory state than the artistical. The great improvements in machinery of recent times have been applied in their full extent to the machinery for coining, and it admits of little doubt that the English mint is superior in this point to any other in the world. The introduction of the steam-engine, especially, has effected a complete revolution in the coining processes, which are now conducted with a rapidity and regularity unknown to the mints of other times and other countries. In combination with the steam-engine, many other improvements, highly characteristic of the age, and highly creditable to the mechanists of the Mint, and to Mr. Field, the "stamper of weights," in particular, have also been introduced, so that there is no room for complaint or regret on that head. The administration of the machinery is a different affair.

Most people would suppose that so national an affair as the national coinage would be entirely conducted by national officers: few venture to imagine that private parties have to do with the matter. Such, however, is the fact. The coinage of the kingdom is executed, not by the "Royal Mint," but by a body having no connexion with the Government, called "the Company of Moneyers." How this company originated it is now impossible to ascertain; all that is known is that such a body has existed in some shape or other, from the very earliest lives; and that the present representatives of "the corporation," claim an absolute prescriptive right to coin the moneys of the realm, at a certain stipulated price, although they do not go so far as to say that they have the right of determining what that price shall be. Under the shadow of this prescriptive right, it appears, the whole of our coinage is even now executed by six or seven private gentlemen, who combine in their persons the rights and privileges of this ancient company of Moneyers, to which ever and anon an "apprentice" is admitted, on payment of the fee of one thousand pounds, and, when he has served his apprenticeship,

of five hundred pounds more. As might be expected from this, the profits of the company are by no means small; from the returns made, where these profits it may safely be taken for granted, are by no means exaggerated, they may be taken at about two thousand pounds per annum for each member, in addition to which, each is provided with a residence at the public charge, and the ground for a *range of stabling*, which, as the moneyer who was examined took care to observe, was erected at the private expense of the corporation. The best of the matter is, that—their "prescriptive rights" apart—there seems no valid reason why the sums received by these gentlemen, or all but a very small portion, should not go into the public purse, especially as the strange anomaly would then be got rid of, that the public coinage should be partially in private hands.

The corporation of moneyers have nothing to do with the preparation of the dies, the metal, or the machinery. The latter is the property of the public, but the moneyers are bound to keep it in repair and good working order! Their duty is confined to the actual coining of the moneys, which takes place under their inspection, and at their expense. By the terms of their contract they are bound to pay the wages of a certain set of men, and to sustain various other expenses, at all times, except "when the Mint is not at work;" and this, it seems, gives rise to endless disputes, as it is not always easy to say when the Mint is, or is not, actually at work: but this is only one of the evils of a system, itself a mass of evil. The actual capital of the company consists only of the money paid in on each member's admission, amounting altogether (there being now seven members) to three thousand five hundred pounds; the thousand pounds paid as an apprentice fee being always forthwith divided among the corporation, as an addition to their regular profits. And yet, with all this—although the corporation make a profit of about 300 per cent. per annum on their capital, their Provost complains, in a letter to the chairman of the committee, that the services they render are underpaid, and makes a most pathetic appeal for the restoration of a *certain 2 per cent.* on the contract prices, *of which they* were deprived by Lord Maryborough on the score that the introduction of the new machinery had effected a great reduction in their expenses. The worthy Provost seems to have had an instinctive misgiving that the profits of the association would be looked upon as rather excessive, and to have acted with all the cunning of an old campaigner accordingly. As matters stand, he has been the first to complain, and, if "the public" cry out after that, it will only appear a stale artifice on the part of the said public to stave off the just claims of the too-oppressed and much-enduring Company of Moneyers. The most satisfactory settlement for all parties would probably be to relieve the corporation from the burden of the compact at the present reduced prices, and to take from them at once all cause for that anxiety at the endless expenses and enormous risks they have to incur on which the Provost dwells so feelingly. Why, the company have, twice within a century, lost by robbery upwards of two thousand pounds at a time. Be it remembered, however, that these losses were duly carried to the expenses of the year, and that they did not reduce the accustomed two thousand per annum in any great degree. Be it remembered, also, that this net income is exclusive of the allowances made for attendance to the moneyers and their apprentices, which are always carefully entered into the "expenses." And after all they submit that their profits are not superior to the usual profits of a manufacturing business. Comment on such an assertion as this is surely superfluous!

There is another department conducted on the same objectionable principle as that of the moneyers. The bullion is melted down, not by a salaried officer of the establishment, but by a "melter," who, like the company, performs his duties for a certain settled remuneration, and acts as a sort of independent manufacturer, although his workshops and utensils are the property of the nation. He is nevertheless an officer regularly appointed by the master of the Mint, and in his case, as in that of the moneyers, it is not easy to see what would be done if it should ever occur that his charges were considered exorbitant. He seems to have a vested right to the melting, as they have to the coining; but there is this advantage to the public in

ase, that in the event of his death rivileges cease. A corporation never and, according to the disinterested on of the moneyer who was exed, the nation must in all time ng, as in all time past within re- carry on the coinage througe the um of the indispensable company. right, he admits, is only a prescripone, but he hints that it would be inable, if need were, in a court of y, if not in a court of law. Such he consequences of the acquisition privilege by an *immortal* body!

he "melter" dwells with some placency on the efficiency of the apus in his department, which far ex- that of any of the foreign mints, which, be it remembered, although r his control, is public property. It extensive that gold to the value of 000*l*. can be melted in twelve hours. operations in the coining department are of corresponding rapidity, and its powers have been sometimes put to a pretty tolerable test, as at the time of the panic in 1835, when the bank required so much "metallic currency" that the presses were kept going almost incessantly, night and day. After all, however, it would take no small time to coin sufficient to pay the national debt, even if the necessary stock of bullion were already in the bank cellars, or if the bank cellars were capacious enough to contain it. The company of moneyers furnished the committee with a curious statement, taken from the books, and which may therefore be presumed to be as correct as such a statement could be made: it gives the weight and value of the of the whole coinage of the country, from 1550 to 1830, and it will be seen that it would pay off only a fraction of "the debt."

"Gold and silver coined from 1558 to 1830:

	lbs.	oz.	dwt.	gr.		£.	s.	d.
Gold....	3,353,568	9	3	21	value	154,762,335	1	10
Silver..	11,822,751	11	6	1	"	39,139,581	0	8."

e amount, it may be allowed, is derable, although it dwindles when in comparision with those which become familiar by means of that y-executed coinage,—paper. One ing-press would suffice in a week o to effect all that was done by the and the Moneyers together in the e 272 years with the less manale materials of gold and silver. Of extent of the machinery required working the latter some idea may be ed from the descriptive catalogue shed of the department under the rol of the moneyers, which was ed and inspected by the come.

"1, The thirty-horse engine and rolling- The bars were here annealed (in the nce of the committee) and passed gh a succession of rollers until they reduced to nearly the thickness red for the particular denomination of nonies.

"2, The drawbench and machinery, where bars or fillets from the rolling-room adjusted to the exact thickness of the

"3, The Cutting-out-rooms, and machi- for cutting out the blank pieces for the ping of the different monies.

"4, The Dying-room, for weighing each of the blank pieces before they are passed into further work.

"5, The Annealing-room, where the pieces are annealed or softened by heat for the stamping.

"6, The Pickling-room, where the pieces are boiled in a weak acid to restore their colour after the annealing.

"7, The Drying-room, where the pieces from the Pickling-room are shaken and dried in sawdust, &c.

"8, The Marking-room, where the pieces are rounded on the edge.

"9, The sixteen-horse engine, applied to the drawbench, the cutting-out, and other machinery described.

"10, The Coining-room, and ten-horse engine, with the machinery, and apparatus for working the presses for the stamping of the monies.."

With all these appliances and means the expense of coining in England is exactly double that in the French mint, —a result attributed by the moneyers to the exceeding nicety of all the operations here, but not wholly unattributable to the introvention of the company of moneyers, the number of purely sinecure officers, and the extravagant rate at which the services of the really executive

ones (except in the engraving department) are remunerated. The Master of the Mint pockets 2000*l*. per annum (it used to be 3000*l*.) without having any duties to perform, and he is by no means the only functionary of the establishment who receives at least a similar sum,—the fortunate members of the Moneyers' Company to wit. Strange to relate, however, there is yet a greater abuse in the administration of the mint, than that with which the company is connected.

There are two officers for testing the purity of the metals sent to be coined, the king's and the master's assay-master. Both of these are in the enjoyment of an ample salary, but they also enjoy the most extraordinary privileges and perquisites. They are in the habit of assaying, not only for the mint, but also for the bank and for private individuals: for these they make a charge, the whole of which goes into their own pockets, while, incredible as it may appear, the whole of the expenses, not only of rent of workshops, but the materials used, and even the wages of the workmen employed, are paid by the public! The king's assay-master admits that his charge is nearly double that of private assayers, and that, at the same time every fraction of the expense is paid by the mint. There is no restriction as to the amount of private business he may thus carry on;—whatever the amount for wages or material, the whole is unhesitatingly passed in the public accounts, and paid as part of the expenses of the coinage. The assay-master actually makes it a merit that his charges are so high, on the ground, that if they were lower this private business would be greatly extended, and the burden to the public correspondingly increased! And he may well claim some credit for his moderation, since has yet another motive for making his private business as large as possible. The process of assaying requires the use of a certain valuable material called water-silver, of which a considerable quantity is used; three-fourths of this quantity is afterwards recovered;—and this recovered silver is actually a *perquisite of the king's assayer!* Thus a premium was actually held out to him to make his privilage cost the public as much as possible: he *was unrestricted* in the number of his *private,—his own*, assays, and, whatever the number, all expenses were paid, and, whatever the quantity of water-silver required, he took the whole! At the time this perquisite was allowed to pass, the profit from water-silver amounted to about 25*l*. per annum. Since then, a sum of 700*l*. per annum has been paid out for water-silver alone, and, if it had been 7000*l*. it would probably have been passed. The whole history of the transaction opens so gross a scene of abuse, that it is scarcely possible to believe the statements made, and admitted to be true by the parties implicated. The master's assayer enjoys a similar privilege with the king's, although not to such an extent, and *he* appears willing to give it up for a "consideration;" while the king's assayer is rather afraid the public service might suffer by such an arrangement!

There is evidently plenty of room for reform in the most of the departments of the mint, but in none is a sweeping and effectual reform more loudly called for than in those with which the company of moneyers, and the king's assay-master are connected. It is to be hoped that, when the resumed enquiry, which will of course be resolved upon, is concluded, such measures will be pointed out by the committee as will effectually answer this highly desirable end; meanwhile, it can do no harm to give the most glaring facts which have already come to light a more extended publicity than they would ever attain if accessible only in the inconvenient form of a parliamentary report.

We have only to add, that the appendix is of little interest, and that a large number of its pages is occupied with a vast mass of unstranslated French, among the rest a large collection of tables of alloys, &c., which can be of no possible use in the position they occupy. This practice of pouring on the head of the public a quantity of matter in a foreign language, although in what purports to be an English book, is one which seems to be in mighty favour with the concocters of parliamentary reports, and official persons generally. It is one, at any rate, which argues the want of sound sense in "the fool who uses it," and one which should always be deeply reprobated, especially when carried to so offensive an extent as in the "Report on the Royal Mint."

MORDAN'S CHROMAPOLYGON, OR HARLEQUIN PATCH-WORK MAKER.

Sir,—In consequence of a taking advertisement from the *Times*, having appeared among the notes and notices at p. 304 of your last Number, and thinking the article might assist me in my business (a pattern drawer) I was induced to purchase one of Mr. Mordan's *new* additions to our *domestic arts*. Guess my surprise, on finding all I had got for my four shillings, was sundry bits of coloured paper neatly cut into diamonds (rhombics); half diamonds (obtuse angled and equilateral triangles); and quarter diamonds (right angled triangles). These *four figures*, with a limited variety as to colour, constitute what was said to be susceptible of combinations *ad infinitum*. Shades of my great grandmother's bed-quilt, and is this "celebrated" production of the pantomine season, to supersede the ever changing and elegant designs of Brewster's kaleidoscope! to render "a new school of design" superfluous, and furnish our Manchester manufacturers, and others, with patterns surpassing all previous productions of taste and skill! Children are now to be taught geometry and (Isometrical) perspective, and the admirable geometrical solids of the ingenious Larkin, with the subsequent labours of professor Farish, and others, put to confusion by—four pieces of paper, which every boarding school Miss may produce at pleasure in any required quantity, without the aid of a *mechanist*. Paper, however is not the only substance to be operated upon; among other things veneers of fancy woods are to be employed. In this material, however, Mr. Mordan is many a long "day after the fair;" in London, at Tunbridge-wells, and several other places, boxes of all descriptions, cribbage-boards, note presses, &c., have for many years been ornamented in this very manner, and in point of style and execution far surpassing any thing that Mr. Mordan has yet achieved.

The subject is one that has long since been exhausted, not only in this country, but also in France, China and elsewhere, and though the chromapolygon should include (instead of four) all the known geometrical figures, it will still be "no go."

Yours, much deceived,

S. DRAGONETTI.

CHAPLIN'S NEW PROCESS OF TANNING.

Sir,—The second letter of your correspondent, "A Tanner", requires a few, and very few, words from me.

In reply to his question, "how the action of tanning would differ, whether the bag be of two hides or one", I must remind him that one of his two objections to my process, was, that no two hides could be found, corresponding with each other in size and shape; and therefore, a part of one must be wasted in cutting it to fit the other; as the two sides of the same hide do correspond, my plan of making the bag from one only, obviates the difficulty.

As to suspending the hides, the material point is not the difference of *position*, but the difference between the absolute weight of liquor, and its pressure, or effort to escape. The pressure is equal in all directions; the weight, of course, tends downward only. The difference in the strain on the hide, is precisely the weight, which, on my plan, is sustained by the floor.

But, in addition to the two reasons for the predicted failure of my invention, "A Tanner" has now discovered a third. He says, "the tannate of gelatine is forced out of the skin". Why, Mr. Editor, the tannate of gelatine, is the skin itself when made into leather—the desired compound of gelatine and tannin. It is not only "the very essence of leather"—it is the leather itself; any thing which may be forced out of the skin, can only be some loose, superfluous matter, which is much better to be got rid of. The purity of my leather, its consisting only of the skin and the tan, is what I particularly boast of. But I will tell your correspondent what the "white sticky" matter really is. It is the soluble matter contained in the liquor, which, after the hide is tanned, and consequently has no longer any attraction for it, passes through with the liquor, and is deposited on the surface, the water being evaporated from it. The appearance of this matter on the outside is a certain indication that the hide is tanned, and I have never found it deceive me; it never appears on any part not perfectly saturated with tan.

As to Mr. Cox's leather, I have not tried it. and therefore can give no opinion concerning it. The experiment on the two inches, in the basin, however philosophical, is not practical enough for me.

I always try leather by wearing it on my feet. But I will undertake to produce all sorts of results in such experiments, with the same leather, if I may have the assistance of a small flask of oil, to be differently applied to the different surfaces.

I think the only way really to try different sorts of shoe leather, is to wear them at the same time, one on each foot; and for such experiments, with Mr. Cox's leather, or any other, mine is always ready.

I remain, Sir,

Your obedient servant,

F. Chaplin.

Bishops Stortford, Feb. 20, 1838.

CRUMMELL'S HOUSEHOLD MACHINE.

Sir,—I am glad to see our townsman, Mr. D. Crummell, has favoured the public with an account of his curious machine, which displays great ingenuity, though I doubt the economy of using it. It is looked upon by all his men as an incumbrance, and more an impeder than a facilitator to their work; but, proud of his production, he insists on its being paraded about from place to place. Some time since he attempted to cut a ditch with it across a marsh; but it would not go a dozen yards without sticking fast in the ground, as half the town knows well. Even in reaping, though it substitutes horse-power for mens' labour, it requires great strength to move. I think carrying so many little contrivances about with it, unnecessarily increases its weight and cumbrousness. There are more wheels in it than in our St. Mary's church clock, besides leather straps and grindstones. I think it is probable Mr. C. may do good by some of his inventions, but this instance is not very promising.

His wish for converting it into a fire-engine sprung from seeing the one recently sent down here from London, which Mr. C.'s son and myself had the pleasure of minutely examining. Without wishing to offend my worthy neighbour, *I must say he is so very enthusiastic in his pursuits, that he thinks others less sanguine are indifferent to the good of society.* It is but justice to add, that Mr. C.'s many improvements in and about this town, evince proof of his abilities.

Apologising for intrusion, I am,

Your obedient servant,

A. Hoger Fox.

Bell Street, Southampton,
Feb. 19, 1838.

MR. WILLIAM HERAPATH'S, OF BRISTOL, NEW PROCESS OF TANNING.

Sir,—I feel myself, in some measure, called upon to enter into the question of tanning, as I have been alluded to by name in a communication from "A Tanner" of Bermondsey, in your last week's Magazine.

It is evident that that gentleman has been *practically* acquainted with the systems of tanning by transfusion, which the patent world will recognize as slight modifications of the original patent granted in 1824 to Mr. F. G. Spilsbury. Thus Mr. S. *clamped* his hides together in a frame, so as to form a flat bag, and then forced his tanning liquor through their pores by the pressure of a column of the liquid; Mr. W. Drake, in 1832, varied it by *sewing* the hides together, introducing the bag into a frame, and forcing the ooze through by a column contained in a funnel inserted into an orifice in the shoulder; Mr. Cox of Wrington then followed by sewing a hide round the edges, and filling the suspended bag with the liquid; and lastly, Mr. Chaplin sews his bag in the same way, but contrives to vary the process by laying the bag on its side as an inclined plane. As I know that two of those patents have been abandoned as utterly worthless, and have satisfied myself by experiment, that the other two cannot be profitably pursued, I hope the patentees still adhering to the principle, will attribute to the right cause, my attempts to shew why they must fail in making either good or cheap leather upon it.

I should premise that good leather is distinguished from skin by three properties. It is insoluble in boiling water; it is imputrescible, and it is comparatively impermeable to water; that a great proportion of the tubes of which skin is composed are the mimute arterial vessels which anastomose with the veins and return to the flesh, without passing through the skin; that the exeretory or exhalent vessels pass outwards to the surface in spirals, and that the hairs on

the surface are each of them enclosed in a sheath, and reached by a nervous fibril coming from the flesh; both sheath and nerve being dissolved during the liming process, and thus producing, in effect, another set of holes passing directly outwards through the skin. Now it must be evident from reflection that upon forcing the liquid through such a prepared or limed skin, it will *only* pass through the *two sets* last mentioned, *leaving the great mass of the skin* (the arteries and veins) untanned; consequently the leather will be *permeable to water*, and will *not have weight*; but this is not all, gelatinous fibrin is soluble in excess of tannic acid (which tanners have found out practically, although they do not know the cause, as they are compelled to proceed gradually from weak to strong oozes); and as the essence of tanning by transfusion consists in a quick process, the gelatinous fibrin lining the two sets of tubes spoken of, *is dissolved* passing to the outside where it deposits (as described by "A Tanner") as slimy tannate of gelatine, which ought to have been left in the hide, and the loss of which is the loss of a good profit. There are many practical difficulties also, but my object is only to look at it in a chemical point of view, but I have no hesitation in prophesying, at the risk of my chemical reputation, that no fortune will ever be made by tanning upon the principle of transfusion.

And now allow me to correct "A Tanner" himself. He has inferred, that because I am a chemist, my process must be chemical; I assure him it is not; I will engage to use his own liquors, whether from bark, valonia, divi-divi, or terra japonica, and to return him leather weighing 3lb. per hide more than he can make by the ordinary mode; it shall be effected in from three to seven weeks from the lime, and thus he shall make four profits in the year instead of *one;* three quarters of his capital shall be withdrawn as useless, if his present business is done: a boy of 14 shall attend to and work 120 hides, and the leather produced shall be equally tanned, although unequal in thickness in different parts of the same hide (whether full of holes, or sound), and, finally, the leather *shall resist the entrance of* water longer, *and be more durable* than any leather *that can be found. In* a very short time "A Tanner" *will* regularly learn how these effects are to be produced; but as he seems a highly intelligent gentleman, and free from the common prejudices of the trade, I should have no objection to enter into a more detailed explanation to him, and even to furnish him with the means of proving all I have advanced.

Your's respectfully,

WILLIAM HERAPATH.

Mansion House, Old Park,
Bristol, Feb. 21, 1838.

P. S.—As a proof of the durability of my leather, I may state that on October 26th, I had an experimental pair of boots made, one sole (the right) having been tanned by my process in 21 days; the other by the same tanner (Mr. Cox) by the same material, in 12 months. I have purposely worn them every day since; yesterday the left sole was worn through in the centre, my own is yet sound. As to profit, nearly 100 butts have been sold, the first experiments, and under every disadvantage of colour, &c., and loaded with all the expenses of the old process, yet they have returned more than a full tanner's profit in three months and 15 days from the time of purchase.

W. H.

PREPARATION OF PURE NITRATE OF SILVER.

Sir,—The following receipt may be of use to some of the readers of your Magazine, who, like myself, are fond of the study of chemistry.

Dissolve a common silver coin or button in pure nitric acid. Evaporate the liquid to dryness, and heat the salt in an iron spoon till it ceases to boil. Then dissolve a very small portion in distilled water, and test it with liquid ammonia, to see if any copper remains. If there is, heat it again a few seconds, and make a new trial: as soon as the nitrate of copper is decomposed, dilute the whole of the mass in water, and filter it to separate the dentoxide of copper set free by the decomposition of the nitrate. Then gently evaporate the filtered liquid. When the evaporation has proceeded to a certain extent (which experience alone can point out), set the solution aside, and the salt, upon cooling, will be deposited in brilliant crystalline scales similar to those of chlorate of potass.

J. FORDRED.

Brighton, Feb. 10, 1838.

A A 2

P.S. I have long been anxiously looking for the *drawing* and *communication* promised by your correspondent, F. P. of Hereford, in No. 696, on the subject of Manifold Writers. Should this meet his eye, I hope he will fulfil the promise he then made as speedily as may be compatible with his "*interest*," which will not only much oblige me, but to my certain knowledge many others also of your constant readers.

Perhaps he may, before this, have made good his word, if so, the insertion of the above will be unnecessary.

J. F.

THE FIRE-BRIGADE.

Sir,—From Mr. Baddeley's last Fire Report it appears that he retains as enthusiastic an admiration as ever of the London Fire Brigade, and, it may be presumed, as decided an opinion as ever of the superiority of the new system—the "Fire Engine Establishment"—over the old one, in which each office had a separate *brigade* of men and engines. By the test of experience, however, most people would be inclined to come to a different conclusion, and, on the data furnished by Mr. B.'s valuable contributions on the subject to the pages of the *Mechanics' Magazine*, to refrain from joining in his opinion, that "the success of the firemen during the past year, has been of a very extraordinary character, and reflects infinite credit upon the *men*, as well ason the *master-mind* who guides them." What facts are we to look to in support of this *dictum?* To the great number of serious and total losses, or (bearing in mind that the new brigade was to pay particular attention to the preservation of life) to the alarming increase of fatal fires? Surely when the returns under these heads continue yearly to increase, it is the worst possible time to select for paying compliments either to the brigade or its director. Their exertions may have been most praiseworthy, but it is at least quite as plain that, on many conspicuous occasions, they have been attended with a most disastrous want of success. Witness two instances which have occurred even since the period to which Mr. Baddeley's report refers; the *total destruction of the* Royal Exchange, in the presence of the whole establishment, and the still more awful calamity in Gravel-lane. Judging from these samples, there will be no want of melancholy interest in Mr. Baddeley's next report; will there be the usual warm congratulations on the "success" of the brigade's exertions?

As throwing some light on the efficiency of the old and new systems respectively, I subjoin a table of the results of the labours of the former in the last year of its existence (1832), and of the latter in the year just concluded, both taken from no other source than Mr. Baddeley's reports, and therefore depending on unexceptionable authority.

Buildings "totally destroyed" and "very seriously damaged" in 1837	144
Buildings "consumed" and "partly consumed" in 1832	56
Gain under the Fire Brigade	88
Buildings "slightly damaged" in 1837	357
Ditto ditto ditto 1832	153
Gain under the Fire Brigade	204
Number of fatal fires in 1837	16
Ditto ditto ditto 1822	7
Gain under the Fire Brigade	9
Number of lives lost in 1837	19
Ditto ditto in 1832	9
Gain under the Fire Brigade	10

With feelings of sorrow, instead of satisfaction, at the sort of "success" which thus seems to have attended the efforts of the new establishment,

I remain, Sir,
Your most obedient Servant,
AQUARIUS.

Feb. 21, 1838.

MARINE STEAM MACHINERY.

In a recent Number (750) of the *Mechanics' Magazine*, when we gave an analysis of the Evidence brought before the Commons' Committee on Steam Communication with India, we confined ourselves to evidence given upon the general question. In the course of the examination of the various scientific witnesses some very important and interesting facts, circumstances, opinions and suggestions relating to steam machinery and steam navigation, were stated, which we made note of, and now embody in a distinct article, in a somewhat analytical, or classified form. We think they will be found interesting not only to mechanics and engineers, but to the scientific world at large.

MR. HALL'S CONDENSERS.

WilliamMorgan,Esq., engineer, (the proprietor of Galloway's paddle-wheel, and which is hence usually called "Morgan's,") stated that Mr. Hall's patent condensers were a most valuable improvement, and one that he should almost say was absolutely necessary to India steam navigation. It had been stated that they rendered the machinery more complicated, and more difficult to put in order when once out of repair, but he does not think so. They may be applied to engines without altogether preventing the common condenser from being fitted to the vessel likewise, so that should any thing occur to them, recourse could be had to the common mode of condensation. The government have ordered one set of these engines (for the Megæra), but they are not yet finished. They are in use in the Hercules, running between Liverpool and Cork, and the engineer of that vessel stated that on the boilers being examined after seven months' working, they were as clean as when put into the vessel, The condensers have been found to answer their intended purpose in every respect, The Hercules boilers are of iron,—and it is one great advantage of Hall's invention, that it enables us to retain the use of iron boilers, which are stronger than copper. There would not be the same liability to accident in iron boilers with Hall's condensers, because they totally prevent incrustation, and the difficulty likely to arise from the necessity of frequently blowing off would be completely obviated. There is no possible way in which incrustation can take place, because Mr. Hall resorts to a very ingenious plan of distilling water in a separate vessel to supply the boiler. Whatever deposit there is, takes place in the separate vessel, so that the boilers and engines are worked with pure water. It is not the boilers only, but the engine likewise which suffers from hot salt water; the injection of sea water into the condensers in the course of time injures the effect of the engine, and destroys the condensers.

Dr. Dionysius Lardner, L. L. D.—"The Committee are anxious to ascertain what your opinion is with regard to the machinery which should be adopted in vessels intended for such voyages (to India), in reference to the improvements lately effected?—The machinery to which the committee have to direct their attention, consists of two parts, very distinct from each other, namely, the working machinery and the boilers. With respect to the working machinery, I have no other observation to make than this, *that I would* recommend it *to be constructed by the very best makers* in this country, of the highest reputation, such as Boulton and Watt, and Maudslay and Field, to insure its excellence; that I would recommend the engines to be constructed so as to work expansively, the valves to be made in the same manner that they are now being made for the vessel which is being built to work between between Bristol and New York, the engines of which are in process of construction by Maudslay and Field. The valves of those cylinders are so constructed that the engineer can cut off the steam at any portion of the stroke he pleases; this is of very great consequence in a case like this, where the economy of fuelis a matter of importance, because in the monsoon for example, it will sometimes happen, when you are going with it, that you need not use steam at all, you will run with the monsoon in the outward passage very often without steam. Frequently it will happen that you will wish to work very much under your power, availing yourselves of the wind to a considerable extent, but helping out the wind by a certain portion of steam, the engine-man will then cut off the steam, perhaps at a fourth or fifth or a sixth part of the stroke, letting it expand the rest, and the consumption of fuel will not only be diminished in the proportion in which he cuts it off, but in a higher proportion, from the expansive action of steam, and therefore I think the expansive valve a matter of very considerable importance. It is with respect to the boilers, however, that the greatest difficulty will be felt, and the greatest doubt lies about the best mode of proceeding. The difficulties consist in this; generally we are obliged to use sea water in them. In the boiling of the sea water, the salt and lime and other solid matter which is held in solution, is precipitated, the steam goes over, leaving these solids behind. After the boiler has been worked for a certain length of time, the salt which remains behind from the evaporated water, mixes up with the water that remains, renders it salter and salter, until at lengh it becomes what chemists call a saturated solution, that is, it can hold no more salt in solution, and immediately then the salt becomes thrown on the surface of the boiler, precipitated in a solid form, and adheres; there is an affinity between the metal of the boiler, especially at that high temperature, and the salt, and it clings to the surface of the boiler, makes a solid wall round about it, a thick lining of this deposit, which has the effect of intercepting the heat of the fire; that heat which ought to pass into the water, remains in the metal of the boiler; and if this incrustation be allowed to collect to any considerable thick-

ness, the metal will be liable to be made red hot, to soften and to have cracks in it, and the boiler to be gradually destroyed. Now this is the main evil that is to be guarded against, and many ways have been suggested from time to time by different projectors of remedying this evil.

"In reference to the deposit in boilers, are you aware that there is a very great difference in the quantity of saline matter contained in the water of the Indian Ocean and the water of the Red Sea?—I have not seen any analysis of this, but I should hardly expect a very great difference, as far as regards the muriate of soda.

"And lime?—Lime is a very small portion in any sea water; the fact is, the muriate of soda constitutes the great bulk of the deposit; there is a little lime and a little sulphate of soda, and a little magnesia, but these are present in extremely small proportions; it is quite true that the lime, as far as it does exist, is the most mischievous; it lays hold of the boiler more tenaciously; it gives consistency and solidity to the muriate of soda, forming an incrustation instead of a loose deposit; but I should hardly expect it would have any very material effect from any difference of proportion that could subsist between sea water in one place and sea water in another place.

"Are there any remedies that you could suggest for obviating the evils that you speak of in steam boilers?—There the ordinary remedies which have been tried, and I can scarcely say that any of them are perfectly effectual; by far the most common one is that which is called the process of blowing out, which consists in expelling the supersalted water from the boiler, and introducing ordinary sea water in its place. If this process were conducted with regularity, the water in the boiler ought never to be allowed to become a saturated solution, you should continually introduce such quantities of sea water as would drive out the water before saturation: but to this there are objections; there is the immense loss of fuel from continually cooling the water in the boiler; you are driving out water at a high temperature, and letting in water at the common temperature of the sea. The consequence is that you are purchasing a clean boiler at the expense of a considerable quantity of fuel. Then the process, if conducted otherwise, is to allow the deposit to collect to a certain extent, and then it is blown out mixed with the water. Now although this process has been enforced as far as it is possible for the owner of the vessel to enforce it, still, not-*withstanding, incrustation is found to collect; I have taken off the interior of boilers incrustation* two inches thick from boilers in which this process was enforced as rigorously as it was practicable to enforce it; for I ought to observe, that it is a process extremely difficult to get regularly executed; the engine-men feel that they are impairing and crippling the rate of the vessel, and they have a natural reluctance to do it. Now another of the remedies besides that blowing out, which has been suggested, is the substitution of copper boilers for iron boilers; it is found that the salt which collects on the surface of the iron boilers is less liable to collect upon copper; some will tell you it does not collect at all, and that they remain perfectly clear, and that nothing but loose deposit is collected, and that that loose deposit may be blown away without harm: but I know that that is not the case, that an incrustation does collect on the surface of the copper, though not in the same degree as on the surface of iron boilers. Now I will give you an example: I have got here a tube, three inches internal diameter, which I took out of a copper boiler at Hull. This tube was taken from a marine boiler which had been two years in operation between Hull and Hamburgh, and the owner assured me that the process of blowing out was observed as rigorously as it was in his power to enforce it, and he asserted his belief that it was fairly executed. Notwithstanding that, this tube is completely stopped; it is not a crust that is collected on it, but it is actually choked by a deposit as hard as marble. Then another remedy which has been proposed for this evil, and which is now in process of trial is an expedient which is known by the name of Hall's condensers. The source of the evil, as I have explained to the committee, arises from our being compelled to work with sea water; if any expedient could enable us to work with fresh water, still more with distilled water, it is obvious, that the evil would be perfectly removed; and the object of the contrivance to which I now allude has been to enable us to do this, to work always with the same water, and therefore, always with perfectly pure water. Now the committee will probably be better able to estimate the efficiency and merit, or rather the probability of efficiency in this contrivance, if I state to them it is not a new one. The celebrated Watt at a very early epoch in the history of his discoveries in steam, and even before steam was intended to be applied to navigation, constructed a condenser of this kind; he conducted the steam as it was drawn off from the cylinder through a multitude of small tubes which were carried through a vessel which was constantly supplied with cold water; the steam, thus divided into threads, and

compelled to pass through those tubes exposed to the affusion of cold water, was of course condensed. Mr. Watt tried this, he laid a drawing of it before parliament, which drawing is now in the possession of his son James Watt, and I have seen it, signed by authorities indicating its having been before parliament. This condenser is in fact Hall's condenser. I have read manuscripts of Mr. Watt's on the subject, and I find it was abandoned by him in consequence of his finding, first, that he never could make a vacuum sufficiently sudden and perfect by it; and secondly, because the tubes constantly got a fur collected on them, intercepting the cold water just as the crust intercepts the heat in the other case, and in fact it was abandoned by him at that time as a hopeless thing. Mr. Hall of Nottingham, has revived it, and has taken out a patent for its application to nautical engines, for the purpose of preventing incrustation; it is exactly the same as Mr. Watt's. It consists of a number of small copper tubes through which the steam is compelled to pass, as it escapes from the cylinder, which tubes are exposed to the cold water exactly in the same way, and the condensation is effected in that way; when the steam is condensed it is passed through a forcing pump, and driven back again into the boiler. The waste which must take place in this case, which will be produced by more or less of this water getting away, one way or another, by leakage—he replaces the waste by a small still in which he distills sea water, which could easily be done if there was no other objection to his contrivance. Now these condensers have been constructed in a great number of private vessels. I have seen them in vessels in ulmost all the ports in England, and I have examined them myself personally, but it is not by merely looking at such things, nor seeing them working, nor by examining the barometer, nor by any mere inspection of the machinery, that a correct conclusion can be obtained about them: it is only by a careful examination of logs fairly kept, giving an account of the state of the barometer gauge, the consumption of fuel, and the actual way the vessel makes for a considerable period of time. It is from this, and from this only, that correct conclusions can be deduced; one of the short ways of arriving at a conclusion certainly would be the examination of the barometer guage; the question that would present itself to any one conversant with the subject would be, does this mode of condensation really produce a vacuum on the other side of the piston, does it really give mechanical effect *to the steam by destroying* the resistance on the other side; now most unquestionably, the guages in those engines do indicate a very superior vacuum.

"Will you state what the indication is? They indicate a vacuum nearly equal to the barometric vacuum. Now, this however, is attended with a circumstance to which I wish particularly to point the attention of the committee. There is an appendage to the condenser of the common steam engine, called an air pump; the object of this instrument is to pump away the cold water which is introduced into that condenser — to pump away that cold water, and clear the condenser of it; but the purpose from which it derives its name is to pump away atmospheric air, a permanent elastic fluid which enters with the cold water which is introduced to condense the steam: cold water in the common state always contains a certain quantity of atmospheric air combined with it, and it is to get rid of this mischievous fluid that the air pump is mainly there. That is the use of the air pump in the common steam engine. In Hall's condensers he has no jet, he introduces no cold water to condense the steam, he concequently introduces no air to be pumped away, and therefore there is nothing remains to be removed from his condensers, except the pure water resulting from the condensation of the steam, and to remove that, it is obvious that an extremely small pump ought to be sufficient. Notwithstanding that, Mr. Hall thinks it necessary, for the proper efficiency of his engines, not only to use as large an pump as is used in the common condensing engine by jet, but he even advocates the use of a larger. If then there be attached to an engine where there is no air to be pumped away, and where there is no condensing water to be pumped away; where there is nothing but the mere condensed steam to be pumped away—if there be attached to that an enormous air pump, there is no wonder at all that there should be a good vacuum kept up; for you can keep up a vacuum without condenser at all, if you will only give us a sufficiently large air pump. That, therefore the barometer guage in those vessels in which Hall's condensers are used should show a very high vacuum with so extensive an air pump in them is not at all surprising, and in my opinion indicates nothing as to the efficiency of the engine.

"Have you any reason to know that the air pumps used in those vessels where Hall's condensers are applied, are larger than the air pumps which would be used in the case of common condensers?—Mr. Hall told me himself that there are as large, and he even said that he would wish them to be larger.

but I contend that they ought not to be there at all; I contend that there ought to be no air pump but only a pump to pump away the condensed steam. And that if there be an air pump there of considerable size, either as large or nearly as large as the air pump of a common steam engine, I say that that air pump is in fact producing the vacuum, which is not produced by the condensers, and that the whole thing is a juggle. It is quite clear, that if you spend your power in working your air pump you are doing nothing; it is just the same as if you was taking money out of one pocket and putting it into the other; you are doing nothing at all.

"Then how can you reconcile this opinion with the declarations that have been made by different persons who have been in those steam vessels for a long period, and who have declared that there is not only an increase of power in the same engines, but, with the addition of Hall's condensers, there is also a saving in the consumption of fuel, to the extent of one-fourth?—I have heard that and I have heard the contrary. I do not wish to be understood as offering these observations with a view to condemn Hall's as a bad principle; it may be a good one for any thing I know; but I offer them merely as grounds for throwing a doubt for the present upon the thing until we see it more extensively tried. I even go so far as to recommend the adoption of Hall's condensers in the vessels at this side of Egypt, because they are always within reach of repairs, and if any difficulty should arise, they are in the neighbourhood of relief. But we ought to be extremely cautious in introducing novelties in the vessels on the Asiatic side of Egypt.

"But your opinion is that if the advantages stated should be demonstrated by a lengthened trial in any vessel or vessels fitted with Hall's condensers, it is an improvement of such importance that it ought to be applied to vessels, and to those particularly now building, where long voyages were to be made by such vessels?—I think it very material, and if I had an opportunity of examining the performance of a vessel with Hall's condensers for a period of a year, in average circumstances of weather, and that I had a good log of that vessel, I would myself then form a judgment of it.

"Can you state the general advantages; you have already stated one advantage arising from Hall's condensers, can you state whether there are any other advantages which in your opinion should recommend those condensers to general adoption?—No, I do not see any advantage beyond keeping the boiler clean, and thereby economizing fuel; *of course there is* economy produced by saving *in the* wear and tear of a boiler; an iron boiler with the common condensers, will last about 3 years, while with him it would last 7 years at least; and I can also vouch for this, that the contrivance is efficient in doing that which it professes to do, namely, in keeping the boiler free from deposit; for I have seen water taken out of a boiler which had been six months in it, and it was perfectly free from all sedement or deposit.

"It is stated also by Mr. Hall's that the valves and pistons are better lubricated by his improvement than in the common way? He says so; I cannot vouch for the fact that they are so. The lubricating apparatus is an ingenious thing; but I do not think it is of the same importance as the other part of his invention.

"You do not apprehend any inconvenience arising from the mixture of the oil in small particles with the steam?— That is one of the objections brought against his contrivance; that it is liable to that. The water will get gradually greasy; nevertheless, I must say that I have seen water taken out of a boiler which has been six months in use, as I stated to you, and very little of that in it.

"It is also stated that that part of the boiler which is immediately above the water line is apt to become oxydized, and that the oil floating on the surface coats that part, and prevents oxydation, and the injury which the boiler would otherwise sustain?—It is very likely that the floating greese would produce such an effect. At the same time I never heard it complained of, that any injurious oxydation really takes place in boilers.

Having given Dr. Lardner's evidence with respect to Mr. Hall's improvements, it is but just that we should at the same time append the latter gentleman's replies to the Doctor's unfavourable remarks, which he has lately published in a pamphlet on the subject of his engines. Dr. Lardner's remarks we are bound to say, are altogether foreign to the *merits* of Mr. Hall's invention. If Watt, or any one else designed or experimented upon a similar plan, but did not succeed in bringing it into a state sufficiently perfect for practical purposes, this is not to preclude others from subsequently entering the field, and if successful, from reaping the reward of their labours. Dr. Lardner acknowledges that "the contrivance is efficient in doing that which it professes to do;" we imagine, therefore, that no further claims can in justice be made on the invention, and that the inventor in realizing the expectations of those who have adopted his engines,

the faith of his professions, has done of which not one inventor in ten oast.

r. Lardner is what is termed an un- witness, so far as relates to his testi- respecting the value of my improved s, but sufficient was elicited from him w the importance of my inventions, by the barbarous practice of supply- t water to engine boilers is superseded, eir being supplied by pure, distilled He also (as well as the other wit-) proves that copper boilers ought to d in marine engines, unless my con- s, &c., are applied; this is an impor- oint, for the difference between the f copper and iron boilers is more than the expense of all my apparatus; con- ntly the first cost of engines, with my vements, is less than that of common s."

. Hall then proceeds to answer Dr. ner's objections, by citing some cor- ndence on the subject which had place previous to the existence of mmittee. It is only necessary that ould extract a portion of Mr. Hall's

n the first place you say, 'I have it objected to your system of conden- , that the condensation is not suffi- y sudden, and that steam of considera- ressure remains uncondensed in the er, even though the gauge connected he condenser may show a considerable m.' Now to show that my system of nsation is not only sufficiently sudden, s sudden as condensation by injection, show you that it is even more sudden condensation by injection, for you will at engines working upon my principle a vacuum that will suspend a column rcury, of from 28 in. to 29½ in. accord- the state of the atmosphere, and that he mercury not undulating more than n inch; whereas the vacuum produced ection will generally cause the mercu- lumn attached to it to undulate from o three inches; and with respect to of considerable pressure remaining densed in the cylinder, when in con- n with the vacuum I have mentioned, ly think that you will, on reflection, at any person propounding such an idea be greatly in error, for it is obvious, f there be any material difference be- the vacuum in the condenser and the ge vacuum in the cylinder, whether my system of condensation or by in- n, it arises from the impossibility of ng and cutting off alternately *instanter*, onnexion of the condenser with the upper and lower end of the cylinder; the use of the indicator is therefore more a check upon the action and perfection of the valves than to prove the degree of perfection of the vacuum in the condenser, which is alone ascertained by the column of mercury attached to it.

"In the second place, you say, 'It has also been objected, that the tubes of the condenser become furred, and at length incrusted with salt or earthy matter, which no distillation practicable, under the circumstances, can expel from the water; that this salt comes over mechanically by a kind of sublimation.' Now I would ask, how salt or earthy matter can come over mechanically or otherwise, from water containing no salt nor earthy matter; for, in the first instance, the boilers are filled with as pure water as can be procured, and that water is converted into steam, and re-converted into water, *ad infinitum*, and no impure matter is ever introduced, except any small portion that might be contained in the first filling of the boilers. It is therefore quite impossible that any furring or incrustation on the metallic surfaces can take place, no matter how long they are used in condensing and re-condensing steam generated from the same pure water. There is no doubt that in the distillation of water strongly impregnated with salt or earthy matter,* the effects you mention would be produced, and I have no doubt this has caused the difficulty of converting salt water by distillation into an article fit for culinary purposes; but I am sure that I need not say another word to convince you that this is not a parallel case with mine, indeed I have had tubes in operation several years, and they are as clean and in as nice order as they were the day they were first put to work; this, I should say, is a practical argument worth a thousand theoretical ones."

Mr. Hall then proceeds to reply to the points relating to the size of his air pump, and the quality of vacuum produced, by quoting a part of his address to the British Association.

"In the first place, the large air pump, (viz. the air pump of the same size as is used in injection engines). * * * We will for argument's sake, suppose in one

* "This is no doubt the case with injection engines, whose boilers are often filled with nearly a saturated solution of salt, and its going over mechanically along with the steam into the cylinders, causes the internal parts of common engines to wear, and become out of order very rapidly, which is not the case with engines upon my principle; this is, therefore, one strong argument among many others in their favour."

case the condenser of an engine to be of double the capacity of the air pump; and in the other case, the air pump to be of double the capacity of the condenser. Now it is quite clear that if the foot valve of an air pump be kept closed during the ascent of the piston, there will be a perfect vacuum in the air pump below the piston, *i. e.* supposing the foot valve and piston to be perfectly air tight, we will suppose this vacuum to produce a column of mercury of 30 in. in height, as indicate by the barometer, and we will suppose the vacuum in the condenser to be, from leakage of air or other causes, only sufficiently perfect to produce a column of 24 inches of mercury. Now in the first instance, where the condenser is of twice the capacity of the air pump, we shall have two cubic feet of vacuum equal to 24 inches of mercury, mixed with one cubic foot, equal to 30 inches of mercury, and the mixed or mean vacuum will be only equal to 26 inches of mercury; but in the instance where the air pump is twice the capacity of the condenser, there will be two cubic feet of vacuum equal to 30 inches of mercury, mixed with one cubic foot of vacuum equal to 24 inches of mercury, the mean of these will be equal to 28 inches of mercury, or two inches more than that produced by the smaller air pump; now what is the sacrifice of power apprehended by Dr. Lardner to procure the additional two inches of pressure which is operative on the area of the working cylinder, and produces so much more effective power? Why is it merely the difference of the friction of the piston of the smaller air pump, and that of the piston of the larger one, both working in a vacuum (?) which, compared with the power gained by the increased pressure on the working piston, is a mere trifle.

"In addition to the above (says Mr. Hall), I beg to quote the Doctor's following assertion before the committee, as it is rather too extraordinary to pass unnoticed. 'For you can keep up a vacuum without a condenser at all, if you would only give us a sufficiently large air pump.' What does the doctor mean by *a sufficiently large air pump?* Does he mean one twice as large, four times as large, six times as large, or eight times as large, as the common air pump of injection engines? if he do, I will tell him without fear of contradiction, that even with an air pump of the last mentioned enormous size, he would not produce even the slightest approximation to a vacuum without a condenser. Does he mean that the sufficiently large air pump is to be even greatly beyond that size, so as to attenuate the steam, and cause one volume to expand into two, four, six, eight volumes, and so on? If he do, it is certainly a wonderful discovery, and its promulgation calculateed to astonish his audience at the wonders he lays before them, which I believe is one point which a *popular* lecturer always keeps in view. In his evidence before the committee, he says, 'that if there be an air pump there of considerable size, as large or nearly as large as the air pump of a common steam engine, I say that that air pump is in fact producing the vacuum, which is not produced by the condensers, and that the whole thing is a juggle.' * * * I must remark, that Doctor Lardner might with equal propriety have called the quantum of the other component parts of my invention a *juggle*, as well as that of the air pump, and have accused me of *fraud* and *deception* in having specified them.

"I cannot dismiss the subject of the air pump without making some further remarks on Dr. Lardner's curious statement, that with my condensers an air pump as large, or nearly as large as the common air pump, produces the vacuum, which he contends is not produced by the condensers. Now I have stated that an air pump eight times as large as the air pump that I use (which is of the same size as that used in common steam engines) will not, without a condenser, produce even an approximation to a vacuum; if this be true, and I challenge contradiction, what becomes of the above assertion of the Doctor—and how can an air pump of one-eighth of that size effect that which he so positively asserts? The fact is this, he appears to have no idea of the possible, nay, I may say certain, entrance of air into the condensers, except through the medium of, and in combination with, injection water. He does not know anything of the practical difficulty, or rather impossibility, of making the joints of condensers perfectly sound, as well as the joints of other parts of steam engines, which have to resist the pressure of the atmosphere and prevent its entering into the vacuum. He is not aware, that without any air pump, even the accidental leaking of air, through imperfect stuffing-boxes, would not only impair the vacuum, but actually destroy it, and stop the engine."

Mr. John Kingston, one of the engineers to the Admiralty, made a report to the Lords of the Admiralty in 1834, upon Mr. Hall's condensers. He went to Ramsgate and back (in the City of London), when he formed, and still holds, a good opinion of the invention. The only objection was, that the pipes forming the condensers were liable to choke. A boiler in which the principle of condensing by surface was applied would last three times as long as a boile

on the common principle. There is a saving in fuel from the absence of incrustation on the boiler, and from its not being necessary to blow off, but the principal advantage is in the saving of the boiler.

HOWARD'S QUICKSILVER ENGINE AND CONDENSER.

Dr. Lardner stated that Howard's "contrivance consists of getting rid of the boiler altogether; he has no boiler; the contrivance consists in making steam without boiling the water; in short, a quantity of quicksilver is placed in an iron pan over a coke fire, and kept at a temperature greatly above the temperature of boiling mercury. A jet of water is injected on the surface of this hot quicksilver, which flashes into steam immediately upon contact with it. This steam in a highly expanded state is introduced into the cylinder, and works the piston in the usual way. It is re-converted into water by being passed through a worm, and returns to the vessel from which the jet is admitted to the quicksilver. Of course, as there is no boiler, there can be no incrustation, the same water being used constantly over and over again, it may be distilled water." "It has been some years in progress; experiments on one or two voyages of some length have been made attended with favourable results, but also accompanied by unfavourable accidents, which caused government to decide upon abandoning further trial, and leaving it in the hands of the projector," who is now engaged in making experiments on a larger scale.

Mr. Pocock stated that Howard's vapour engine was the "finest theory," and had succeeded to a certain extent.

PADDLE-WHEELS.—*Morgan's.*

Dr. Lardner stated that the performance of vessels having Morgan's paddle-wheels was better in a considerable proportion than with the common paddles; but that their mechanical complexity is such that if any accident happened to them in the Indian Seas, which would disable the vessel, they would not be repaired with any skill or means which would be available, in such a place. He recommends their adoption in vessels on the European side of Egypt.

Mr. Kingston would not recommend the use of Morgan's paddle-wheels. The principle of the wheels is good, but they would not run more than 22 months or two years without repairs. He has had a great deal to do with them; as much as any one. They were taken off the Tartara, after being on *only 14 months, and wanting* thorough repair.

Captain Oliver, R.N., considered Morgan's wheels as superior in power to anything we have ever had. They are more liable to injury than the common wheels, but they wear equally.

Field's, or Galloway's.

Dr. Lardner.—There is a "form of paddle wheel, differing from the common one, and which I believe will be more efficient than the common one, which is less subject to this objection (that of mechanical complexity.) It is called the split paddle; the paddle board instead of being one uniform flat surface, is split into a number of narrow leaves, placed one beside another, not very unlike the position of the plates in a Venetian blind. We have not had this used as extensively in practice as Morgan's wheel; but looking at it theoretically, I should say it promises to be attended with advantages over the common wheel; and it has this great advantage, that it is equally simple; that the fracture of one of the paddle boards would be as easily repaired in that, as in the common paddle wheels; and in some respects perhaps easier.

Mr. Kingston stated that the government were making trial of Mr. Field's cycloid wheel, the invention of which Mr. Galloway claims. Mr. Field is making some excellent experiments, and if it succeeds in sea, as it does in still water, it will be the best wheel that was ever made or thought of. "It is a wheel differing in no other way from the common wheel, except that there is a double set of boards, not a plain rectangle, but the board is taken off, and it is brought as it were in a parallel position, with an interval between the edges; we have only two-thirds of the area of board on the wheel we are now trying, and there is an advantage in point of speed over the whole board. I cannot account for it; it will require some consideration." There is nothing to prevent their being applied in rough as in smooth water. They are simple, durable, and possess all advantages if they should succeed at sea.

Various Suggestions as to Paddles.

Unshipping.—*Dr. Lardner* thinks that shipping and unshipping paddles would be attended with great difficulty. The Medea, which is remarkable for combining good sailing with good steaming qualities, sails with her paddles in the usual place. It is of the very last degree of importance that when paddles are in action they should be in the most stable, firm, and strong position, and therefore any means of unshipping them must be a means compatible with restoring them to that degree of stability and strength which one can scarcely imagine to be matter of temporary adjustment, alterable at pleasure at sea.

Captain Oliver stated that there were two modes of proceeding when the vessel was using sails; one to disconnect the wheel from the engine, and allow the wheel to revolve; the other, to displace a portion of the boards. Neither the segments nor the arms are disturbed. The skeleton wheel would not impede the vessel more than an anchor stock.

Size of Paddle Boards, and Depth of Immersion.—Captain Oliver.—There is an experiment going on at Woolwich; the boards have been reduced very materially, and it is found that the vessel goes faster; and the minimum is not yet come to. "I have tried to a limited extent, the experiment myself, and was going on with it by a reduction of the board, (of the common radiating paddle), and I have found a great advantage in it." All sea-going steam-vessels have their paddles overboarded. One-sixth is considered to be the best depth to immerse the wheels. By increasing the power they get into the difficulty of immersing the boards, which is the reason in a great measure that light power acts better than heavy power; a ship may be overpowered.

BOILERS.

Mr. J. L. Peacock stated that he thought iron boilers should not be used in long voyages. Copper last longer, and the longer you can keep any part of the machinery undisturbed, the better.

Mr. Morgan would recommend iron boilers, because he should recommend condensation by surface; it has now been so long tried by the best experiments, and has certainly succeeded.

Dr. Lardner would advise the use of copper boilers; although they are double the expense, yet they last a greater length of time, and the old materials are available for sale at a considerable price afterwards. If Hall's condensers are used, however, it would be useless to go to the expense of copper. There would be less liability of copper boilers bursting, and the explosion would be attended with less danger. He does not think that explosions could take place in wrought iron boilers from a combination of oxygen and hydrogen, whether produced by decomposition or any other cause.

[See the first part of Dr. Lardner's evidence, p.357.]

STOKING AND STOKERS.

Dr. Lardner.—"I have recommended eight stokers (for a vessel of 1000 tons and 250 horse power), which is an unusual complement of that class of men for such engines, partly in consequence of the heat of the climate, and also in consequence of another circumstance, which I would wish specially to impress on the attention of the committee, namely, that the economy of fuel depends, in a very great degree indeed, upon the attention and skill in stoking; according to the way in which the fires will be stoked you may produce a saving of fuel fully to amount from 20 to 25 per cent.; if the coals are shovelled in in an enormous quantity, and the fire places choked with them, the door then shut up, and the men sit down to rest, the consequence will be that you will produce a prodigious smoke from the chimney, the fire is impeded for the moment, and your coals will be wasted. If, on the other hand, you stoke your fires in the manner that smoke-consuming furnaces are stoked, by laying in coal gradually, and in small quantities, on the front of the grate, and as it reddens shove it back towards the back, you will have no smoke from the chimney; you will consume all your coals, and you will gain from them the greatest quantity of heat which can be obtained in that kind of furnace, and the result will be a saving according to the care and skill with which this is executed, of frym 20 to 25 per cent. of your fuel. Now this can only be accomplished by selecting good stokers, paying them well, and not overworking them; but while they are stoking, make them stoke; let them have an abundant quantity of rest, but while they are in the stoking room, keep them constantly at work. It is found in the Admiralty vessels that the judicious selection of stokers, and the enforcing of a rigid duty from them, has produced a most material effect in the economy of fuel; and I would also strongly impress upon the committee the expediency of insisting upon the captains of the vessels knowing something of the mechanical part. It is utterly vain to think of managing these vessels so far from Europe as they will be, if the captain is the slave of his engineer, and he always will be the slave of his engineer if he is not himself acquainted with the details of the engine. It will be quite essential that he should be conversant with the details of the engine."

Mr. Morgan stated that the heat of the engine-room and the climate of the Mediterranean, so completely relaxes the stokers that they require a great deal of rest. He has "known men lifted out of the engine room—hauled out of the engine room actually exhausted, during the heat there is in the Mediterranean or the Adriatic."

COAL BOXES.

Dr. Lardner recommended that the coal boxes of steam-vessels for long voyages,

should be tanked, in order that the trim of the vessel might be maintained by replacing the coals as they were consumed, by sea water.

EXPERIMENTAL BRICK BEAM.

Messrs. Francis and Sons, the Roman cement manufacturers, at Nine Elms, some time ago erected what is termed a "Brick beam." This beam was composed of 19 courses of gray bricks, cemented together with the best Roman cement instead of mortar, and having in some of the courses hoop iron placed horizontally. The length of this beam was about 24 or 25 feet, the ends resting on upright gables or pedestals. The width of the beam was two bricks and a half, placed lengthwise. The purpose was to show the efficacy of the Roman cement by its adhesion to the hoop-iron as well as to brick, and its consequent adaptation, at a comparatively small expense, to many purposes where an arch could not be so conveniently used, such as railroads, &c. For some time past a weight of iron, amounting to nearly 11 tons, has been suspended by chains over the beam, and it has stood firm and unmoved. Messrs. Francis resolved, on Wednesday, to test to the utmost the strength of their contrivance, and commenced at half-past twelve o'clock gradually to increase the weight attached to the chains. At half-past two o'clock the weight suspended across the beam was upwards of 22 tons, and at that time the pedestals began to diverge a little outwards, and in a moment afterwards the beam broke across at the place where it was traversed by the chains. The rent or break was almost as clean as if cut with a knife; there was no crumbling of the cement, nor did the bricks separate from their interstices, the whole fracture was as if a piece of solid rock had been suddenly divided by some irresistible power. As far as the goodness and efficacy of the cement were concerned, the experiment was perfectly satisfactory. There can be no question that a beam of this sort may be made available for many purposes; whether or not the rumbling of carriages over a bridge built on this principle, or on a viaduct, would, by the vibration, cause any alteration in its stability, remains perhaps to be proved. From what was seen yesterday, enough was proved to evince the very superior tenacity of the cement, and to show that an important improvement has been introduced at a very low rate of additional expense.*—*Times.*

* See Col. Pasley's experiments upon this subject in our present *Vol. pp.* 22, 42.—*Ed. M. M.*

RAILROAD TRAVELLING CONDUCIVE TO HEALTH.

Mr. Curtis, in his second edition of his valuable little work on the Preservation of Health, makes the following remarks:—

"In enumerating the improvements that have taken place in the metropolis as regards the health of its inhabitants, we must not omit the railroads. Some of my readers may be disposed to ask, in astonishment, what railroads have to do with health? I answer, that leaving out of view the obvious connexion between them in the facilities which railroads afford for enjoying the fresh air of the country, they have in themselves a direct influence upon health of a most beneficial nature. Dr. James Johnson, in the last number of the *Medico-Chirurgical Review*, has the following remarks on the subject:—

"'Railroad travelling possesses many peculiarities, as well as advantages, over the common modes of conveyance. The velocity with which the train moves through the air is very refreshing, even in the hottest weather, where the run is for some miles. The vibratory, or rather oscillatory, motion communicated to the human frame is very different from the swinging and jolting motions of the stage-coach, and is productive of more salutary effects. It equalises the circulation, promotes digestion, tranquilises the nerves (after the open country is gained), and often causes sound sleep during the succeeding night; the exercise of this kind of travelling being unaccommodated by that lassitude, aching, and fatigue, which, in weakly constitutions, prevents the nightly repose. The railroad bids fair to be a powerful remedial agent in many ailments to which the metropolitan and civic inhabitants are subject.

"'To those who are curious, and not very timid, the open carriages are far preferable to the closed ones, especially in fine weather. In bad weather, and particularly at first, invalids may travel with more advantage under cover. I have no doubt that, to thousands and tens of thousands of valetudinarians in this overgrown Babylon, the run to Boxmoor or Tring and back, twice or thrice a week, will prove a means of preserving health and prolonging life more powerful than all the drugs in Apothecaries'-hall.'

"The Doctor observes, that 'the railroad journey, however, is not without its inconveniences, many of which may be prevented by a little ingenuity. The greatest is, the discharge of cinders, some of them ignited, from the chimney; which are not only disagreeable, but occasionally dangerous to the eyes of those in the open car-

riages.' This inconvenience may be avoided by the use of my convex wire-gauze spectacles, which I lately invented for wearing in the wind, dust, or sun, and which for this purpose will be found far preferable to glass. They are made convex, in order that the eye-lashes may not come in contact with the wire, which sometimes happens with linen and other gauze spectacles.

"Admirable as railroads are in most respects, it is deeply to be regretted that so many accidents, as they are termed, have occurred upon them. Most of these appear to have resulted from gross carelessness or incapacity on the part of the conductors of the engines. A situation like this, on which so many lives depend, should be intrusted to none but men fully competent to the discharge of their duties, and of known sobriety and steadiness; and it deserves to be considered, whether it would not be advisable that these engineers should be subjected to the same responsibilities as pilots of vessels; and, in case of neglect, be dismissed from their posts, and never afterwards employed. The Railroad Companies owe it to the public and to themselves, to pay more attention to this subject than they appear to have done hitherto."

USE OF STEAM IN THE ECONOMISING OF FUEL. BY ANDREW FYFE, M. D., &c. EDIN.

Dr. Fyfe caused steam to pass through a porcelain tube, stuffed sometimes with charcoal, sometimes with coke heated to redness in a furnace, collected the resulting gas, generally over a water trough, but sometimes over mercury. His inference from a variety of experiments is, that the gas contains hydrogen, oxygen, and carbon, and that the two last are in the state of carbonic oxide. Hence the combustion of the gas gives rise to the formation of carbonic acid and water.

When air was freely admitted to the incandescent material, at the same time that steam was driven through it, Dr. F. found that the water of the steam was, in part at least, consumed, and that the heat was thereby augmented. This was proved by the greater quantity of water evaporated in a given time. On an average, for each ounce of steam thrown into the furnace, there were four ounces additional evaporated, over and above that evaporated without the transmission of steam, provided the steam was thrown in cautiously. This increase of temperature by the use of steam as a fuel was not effected at the expence of a greater quantity of fuel, for there was rather less fuel consumed when steam was transmited through it than when omitted, while at the same time the quantity of water evaporated was increased. To arive at correct results, it is necessary to throw the steam in cautiously.

It is thus proved that water, while passing in the state of steam through fuel, not only acts as a sort of blast, but, at the same time, itself undergoes combustion, by the formation and consequent consumption of inflammable gaseous products; and the increase of heat, Dr. F. thinks, will more than compensate for any extra expenditure for converting the water into vapour.

The author states that the only instance which he had found on record in which steam was passed through fuel with any definite object in view, is mentioned by Mr. Mushet in the 6th volume of Tilloch's Magazine. Had he consulted the early volumes of Silliman's Journal, and also the 25th vol. of that work, he would have found a succession of papers by Samuel Morey, in some of which the use of water a as fuel is distinctly alluded to, and in the last paper its application is proposed by that indefatigable experimenter to one or two practical purposes,

The forgoing account of Dr. Fyfe's experiments is abstracted from his papers in Jameson' (Edinburgh) Journal, No. 45.

SOLIDIFICATION OF CARBONIC ACID GAS.

Mr. Kemp, of Edinburgh, who has been so successful in his experiments upon the liquification of the gases, has succeeded in reducing carbonic acid gas to the solid state. This experiment, which had been previously shown in Dr. Hope's class-room, Mr. Kemp exhibited before the Wernerian Society, at their last meeting, in presence of Professors Jameson, Forbes, Graham, Trail, Welsh, Pillans, Dr. Neill, and a number of other scientific gentlemen. The gas requires a pressure of thirty-six atmospheres to reduce it to the liquid form. When the pressure was removed, by opening a small stopcock in the condensing apparatus, the cold, produced by the rapid evaporation of the liquid, was so great, that the whole mass was almost instantly reduced to the solid state; and in this condition, although the temperature could not have been less than 180 degrees below zero of Fahrenheit, it was handled and tasted by many of the gentlemen present. This circumstance indicates, in a remarkable manner, the slow conducting power of the substance. When solid mercury is applied to the skin, in its passing to the liquid form, it produces such a degree of cold as to cause disorganization of the part. Nevertheless, the solid carbonic acid was applied to the tongue without producing any disagreeable sensation; but, when mixed with the sulphuret or proto-iodide of

carbon, the cold produced was so intense, that every liquid to which the mixture was applied was instantly frozen. Mercury, in the proportion of twenty parts of the metal to one of this powerful freezing mixture, was solidified. Liquified chlorine and cyanogen gases were also frozen by it; and, as Mr. Kemp had previously solidified sulphurous acid gas, there are now four substances, lately known to us only in the gaseous state, which he has now exhibited to the world in the form of tangible solids. This is the first time that the solidification of carbonic acid has been accomplished in Great Britain. Many important results may be expected to accrue from it. The degree of cold that may be produced in consequence is so far beyond any that has hitherto been attained, that there can be no doubt, that any liquid may be frozen by it, and it will be a powerful agent in producing the condensation of those gases that have hitherto resisted all attempts to reduce them to a liquid form.—*Scotsman.*

LIST OF ENGLISH PATENTS GRANTED BETWEEN THE 25TH OF JANUARY, AND 24TH FEB. 1838.

William Bate, of Werrington, Northampton, Esq. for certain improvements in obtaining and regulating power. Jan. 27; six months.

Matthew Heath, of Furnival's Inn, London, Esq., for improvements in engines to be worked by steam or other fluids, being a communication from a foreigner residing abroad. Jan. 27; six months.

Charles Fiude, of Long-lane, Bermondsey, Surrey, manufacturing chemist, for his invention of improvements in applying heat to the manufacture of alkalie and salts, and for smelting and otherwise working ores, metals, and earths. Jan. 30; six months.

Charles Phillips, of Chipping Norton, Oxford, surgeon, for improvements in apparatus or machinery for punching, bending, cutting, and joining metal, and for holding or screwing metal to be punched, bent, cut, or otherwise operated on; parts of which machinery are adopted to perform some of these operations on other materials. Jan. 30.

John Barnard Humphreys, of Southampton, civil engineer, for his invention of improvements in marine and other steam engines. Jan. 30; six months.

David Wilkinson Sharp, of Biunley, York, worsted spinner, for certain improvements in machinery or apparatus for warping worsted, linen, cotton, silk, or woollen yarns. Jan. 30; six months.

George Ryder Peppercorne, of Vauxhall, Surrey, gent., for an improved machinery to be employed for locomation on railroads and other roads, which is also applicable to other engines for exerting power. Jan. 31; six months.

William Holme Heginbotham, of Stockport, Chester, gent., for certain improvements in the construction of gas retorts. Jan. 31; six months.

George Charlton, of Wapping, Middlesex, master mariner, for improvements in anchors, capstans, windlasses, and means of mooring and riding ships at anchor. Feb. 8; six months.

John Melville, of Upper Harley-street, Middlesex, gent., for improvements in the generation of steam, and on the applications of steam to navigation. Feb. 8; six months.

Jerome Deville, of Crutched Friars, London, coach-builder, for certain improvements in railroads and in the carriages to be used thereon. Feb. 8; six months.

Robert Essex, of St. Mary Islington, Middlesex, silversmith, for certain improvements in the construction of paddle wheels, and in the paddle boxes or cases of steam vessels. Feb. 8; six months.

James Dutton, of Wotton, Under-edge Glocester, clothier, for certain improvements in the manufacture of woollen cloth, which improvements apply both to weaving and dressing of woollen cloth. Feb. 8; six months.

William Farquhar, of George-street, Tower Hill, London, chronometer maker, for improvements in generating steam for steam-engines. Feb. 13; six months.

Johann Gottleb Seyrig, of Paris, in the kingdom of France, mechanician, now of Old Compton-street, Soho, Middlesex, for certain improvements in expressing or extracting liquids or moisture from woollen, cotton, and other stuffs, and substances, either in a manufactured or unmanufactured state. Feb. 16; six months.

John Ericsson, of Berkeley-street, Connaught-square, Middlesex, civil engineer, for an improved steam-engine. Feb. 16; six months.

John Jackson, of Kersley, Lancaster, joiner and cabinet maker, for certain improvements in sawing planing, tongueing, and grooving, and otherwise preparing or constructing window sashes, door, and other frames, cornices, mouldings and various other fittings or ornamental wood work; and in machinery, tools, or apparatus to be used in the same. Feb. 16; six months.

Eugene Richard Ladislas de Breza, late of Paris, but now of St. Martin's-street, Leicester-square, gent., for a chemical combination or compound for rendering cloth, wood, paper, and other substances indestructible by fire, and also preserving them from the ravages of insects. Feb. 20; six months.

Jeremiah Grime, of Bury, Lancaster, engraver, for certain improvements in manufacturing wheels which are applicable to locomotive engines, tenders and carriages, and to running wheels for other useful purposes, and also in the apparatus for constructing the same. Feb. 21; six months.

John Clay, of Cottingham, near Hull, York, merchant, Samuel Walker, of Millshaw, near Leeds, cloth manufacturer, and Frederick Rosenborg, of Hull, gent., for certain improvements in machinery or apparatus for shearing or cropping, and dressing and finishing woollen and other cloths. Feb, 22; six months.

Edward Stelle, of Arundel-street, Strand, Esq., for improvements in making sugar from sugar cane, and in refining sugar. Feb. 24; six months.

Moses Poole, of Lincoln's-inn, Middlesex, gent., for improvements in preserving wine and fermented liquids in bottles, being a communication from a foreigner residing abroad. Feb. 24; six months.

John Houlston, of Bradford, York, printer, for improvments in apparatus for stopping or retarding carriages. Feb 24; six months.

Ambroise Ador, of Leicester-square, Middlesex, chemist, for certain improvements on lamps or apparatus for producing or affording light. Feb. 24; six months.

NOTES AND NOTICES.

The Patterns and Inventions Bill, which was to have been read a second time in the House of Commons on Wednesday last, is again put off! There were not sufficient members present to constitute a house.

Sunday Railway Travelling.—At the general meeting of the London and Birmingham Railway Company, held on Wednesday last, Mr. Sturge, brought forward his motion to close the railway on Sundays. The question was very ably argued on both sides, and on a division the motion was lost. The numbers being, for the motion 3621; against 1486.

Isthmus of Panama.—We are told in the French papers, that Mr. Warden, the American Consul at Paris, author of the well known statistical view of the United States, made on the 6th of February, a communication to the Parisian Academy of Sciences to the effect, that in the course of the next year a canal would be completed through the Isthmus of Panama. Beginning at the mouth of the River San Juan de Nicaragua, in 10 degrees 58 minutes of northern latitude, it is to follow the course of that river to the Lake of Nicaragua, pass through the town of that name, and through Soriette, and issue into the Pacific in the Gulf of Papagayo. This plan is not novel, it is that on the basis of which some years ago the government of Guatimala announced its readiness to receive proposals from capitalists or companies, but with such restrictions that the allotted time elapsed without its receiving one. The novelty of Mr. Warden's communication consists in the announcement, that the plan is on the point not only of execution but of completion, and further details on the subject will we are sure, be looked for with interest.

Machine Manufactory in Holland.—A company is at present forming in Holland for an undertaking of national importance, the establishment of a great manufactory of machines. Hitherto Holland has been almost entirelysupplied with these from abroad, but the new company has been already joined by so many of the first manufacturers as to hold out a strong prospect of success. At present the most important establishment of the kind in Holland is the steam-engine manufactory of the Steam Navigation Society at Feyenoord, near Rotterdam, many hundred workmen are employed there, and a great number of steam-engines are in course of manufacture as well as a sea steam-boat of 200 horse power.

Fires at St. Petersburgh.—It may be interesting to compare the number of fires in another of the great capitals of Europe with the number of those in our own vast metropolis, as reported by Mr. Baddeley. The conflagrations at St. Petersburgh in 1837, amounted to 30; of these, as might be expected, the most important was that of the magnificent Winter Palace on the 29th of December, at which thirteen persons lost their lives, and twenty-three were more or less seriously injured. The population of St. Petersburgh, in 1837, was 468,625 souls, not far short of a third of that of London in 1831.

Steam Navigation on the Danube.—The Austrian government granted on the 15th of December last year, an exclusive privilege to an Englishman, Capt. Andrews, for certain improvements in steam-boats. These improvements will, is is said, contribute much to accelerate the progress of steam navigation on the Danube, their chief tendency being to enable the boats to be of lighter build, and thus to require a less draught of water; the shallowness of the Danube at different points, having hitherto it is well known, formed the great obstacles to its utility as a navigable river. It is added, that in consequence of this alteration in the construction of the vessels, they will be enabled with equal power to make more way than boats of the older build, and will require a less supply of fuel. At Vienna, expectations of the utility of the new invention are high, from the high reputation Captain Andrews has already acquired there as a mechanist. Captain Andrews, who had previously built several sea steamers in France, has for some time given his services to Austria, and superintended the construction of five steamers now employed in the Danube, the Francis the First, Argo, Pannonia, Zrinyi, and Nador, which are found to surpass in speed all the others of equal horse power, from 40 to 80 horses.

Manufactures in Mexico.—By recent letters from Mexico, it appears that manufactures in general, and the cotton manufacture in particular, are making greater progress in that country, than would have been supposed. Large orders for spinning machinery have been sent to the United States, in consequence it is said, of their exportation from England being prohibited.

New Royal Academician.—At the last meeting of the Royal Academy, when four new academicians were elected, the honour was conferred upon Mr. William Wyon, the chief engraver of her Majesty's mint, who had previously been for some years an associate, but who is, we believe, the first of his profession, that of medal engraver, who has ever attained to the dignity of full "R. A." The choice does honour to the academy, as well as to the individual receiver of the honour, who is unquestionably the "foremost man" in his line of the present day.

Premium for a Steam Plough.—The Highland and Agricultural Society of Scotland, have just issued their annual list of premiums for the year 1838, among which the most considerable is one of five hundred sovereigns, for the first successful actual application of steam power to the operations of the tillage of the soil, more particularly ploughing and harrowing. The conditions require it to be proved that the new process is more effective and economical than the old one by animal labour, and also, that the apparatus shall be put in operation in Scotland, under the view of a deputation of the Society. This splendid premium is likely to be speedily claimed, although we believe Mr. Handley's and other steam ploughs hitherto tried have scarcely answered the conditions stipulated for. The other premiums offered are for objects of smaller national importance.

Railways in Scotland.—From *Oliver and Boyd's Edinburgh Almanack*, for 1838, we gather the following particulars regarding the railways commenced during last year:—The Dundee and Arbroath Railway. An Act of Parliament was obtained in 1836 for the formation of this railway, which is considerably advanced, and will be completed in 1838. Its length will be nearly sixteen miles and three quarters, and the capital required 99,844*l.* The Glasgow, Paisley, and Greenock Railway, for the formation of which an act was passed in 1837. Commencing from the south end of Glasgow Bridge, it will proceed to Paisley; and, running nearly parallel to the Clyde, with a branch to Port Glasgow, the line will terminate at Greenock near the harbour. The estimated expense is 393,000*l.* The Glasgow, Paisley, Kilmarnock, and Ayr Railway. The line from Glasgow to Paisley is intended to be common to, and to be executed at the joint expense of, the Glasgow and Greenock and the Glasgow and Ayr Railway Companies. Near Dalry it will separate into two branches; one running direct to Kilmarnock, and the other passing by Kilwinning, where it joins the Ardrossan Railway,—Irvine, where it communicates with the town and harbour,—Troon, joining the Kilmarnock and Troon Railway, and terminating on the quay at Ayr. An act was obtained for this railway in 1837. The estimated expense is 659,000*l.*

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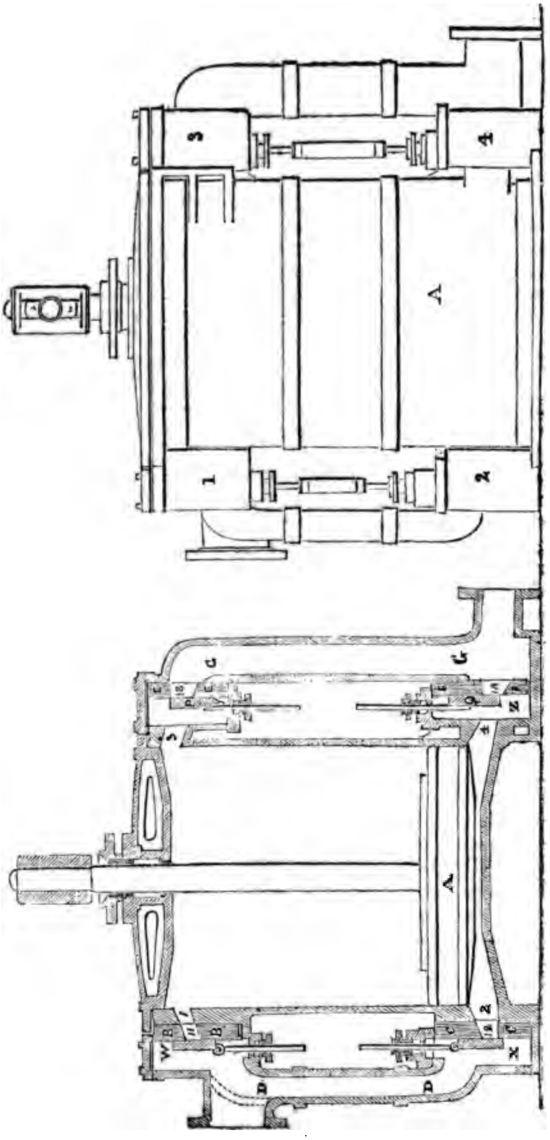
MESSRS. SEAWARD'S PATENT STEAM ENGINE SLIDE-VALVES.

Fig. 1

Fig. 3



MESSRS. SEAWARD'S PATENT STEAM ENGINE SLIDE VALVES.

It is well-known that the steam slide now mostly used by eminent engine makers, is liable to many objections; one of them, and a most important one too, arises from the necessity of using hemp packing at the back of the slide, to keep it on the face; this packing requires to be constantly adjusted by the engine-man, which is a tedious operation, of considerable importance to the well-working of the engine, and necessarily requires a man of experience to attend to it; this adjustment takes place more or less every day the engine is at work, and should it be neglected or ineffectually performed, there will be a great loss in the active power of the engine; in fact, it is quite notorious, that in most cases where engines are working indifferently, it is owing to the ignorance or want of attention of the engine-man to this important part of the mechanism. Indeed it may safely be affirmed, that the packed slide-valve is never perfectly tight, because if the packing be secured down so close as to prevent the escape of steam through it, it will require the power of two or three men to move it; thus it becomes necessary for the easy working of the slide valve, to admit of this escape, and consequent loss of power, rather than contend with the enormous friction which results when the valve is packed quite tight.

Again, the quantity of hemp used for packing, as well as tallow employed to lubricate the same, is very great, and the wear and tear upon the slides, owing to the force with which they are kept against the faces, are some of the serious objections to which this description of slide-valve is subject.

To obviate the above, as well as other difficulties attending the practical use of the present slide-valve, for a considerable period occupied the attention of Messrs. Seaward the eminent engineers, and they invented and patented the slide-valves hereafter described. The result of three years' trial of the valves upon engines of various powers, shows the following advantages:—First, They require little or no attention from the engine-man, having continued to work perfectly tight at least three years, without adjustment or examination. Secondly, The ease and regularity with which they work; as there is no force used to keep the slide on its face, except the simple pressure of the steam, the friction is therefore reduced to the smallest possible quantity. Thirdly, These valves *require no balance weights nor balance gear*, the steam valve, and eduction valve, exactly balancing each other; and the ease with which they are moved, for the purpose of setting the engines in motion is remarkable, one man having a perfect and immediate control over a pair of 80-horse marine engines. Fourthly, These valves are *always perfectly tight*, and provided there be no air leak in the engine, the barometer will be retained at its highest possible point; for the slides being once ground true to their faces must continue so, as the pressure upon them is equally distributed, and never exceeds the simple pressure of the steam. Further, each valve is so small (that for an 80-horse engine not exceeding 8 inches by 16,) that they are not liable to contract or expand by the heat of the steam, and from the absence of any packing or force being required to keep them on their faces, they are as easily moved, when the engine is quite cold, as when the cylinder is charged with steam. Lastly, Engines fitted with valves upon this principle, are completely secured from those fatal accidents which are so often occurring by the accumulation of *water within the steam cylinder, the steam valves themselves acting the part of safety valves* of the most perfect description, in this instance. For, should water accumulate upon or or under the piston, it will be driven by the piston itself back into the boiler, the valves themselves lifting off their faces to allow of its escape; thus the possibility of danger is averted, as well as the expense of attaching safety valves to the cylinder, which at best form but a very inadequate protection. Further, in point of economy, it is ascertained that one-sixth the quantity of oil now used to lubricate the packed slide is sufficient for the patent ones.

Description of the Patent Slide Valves.—Messrs. Seaward's, improvements consist in arranging or combining the four principal sliding-valves of steam-engines in such a manner as to produce the following effects. First, that either the upper or lower steam slide-valve, or the upper or lower eduction slide-valve is

Fig. 2

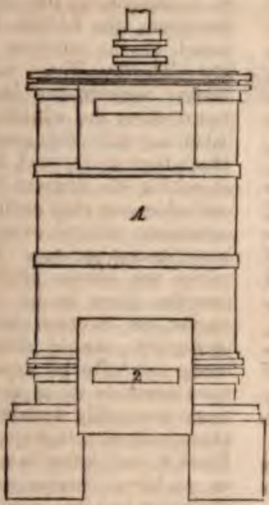


Fig. 4

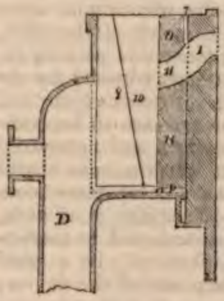


Fig. 5

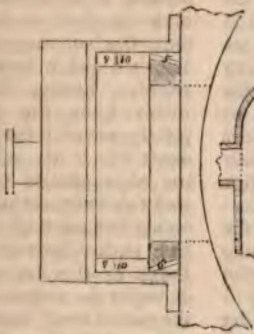


Fig. 6

double acting engines, or the steam slide-valve, the equilibrium slide-valve, or eduction slide-valve, in single engines, may with its face be separately taken out of its place, and either repaired or renewed without in any way affecting or disturbing any one of the other principal sliding valves, or faces of either of the said engines. And, secondly, that each of the said four principal slide-valves shall be pressed upon its face by the simple pressure of the steam only; so that, should water at any time accumulate *within the cylinder, it will* be ejected *back into the steam-pipe* without in any *way affecting the tightness ef* the sliding-*valves or faces of* the steam-engine.

Thus, for a double acting engine, the working-cylinder is cast with four separate nosles, branches, or passages, as shewn in fig. 1, which is a side-elevation of the cylinder. A, is the cylinder; 1, 2, 3 and 4, are the four nosles, branches, or passages.

Fig. 2, is a front elevation of the same cylinder, shewing two of the nosles, branches, or passages, 1 and 2, which are for the entrance of steam into the cylinder, and upon which are attached the steam-pipe D, D; (see fig. 3, which is a vertical section of the same cylinder; the same letters and figures denoting the same parts in each of the figures); and upon the nosles 3 and 4, the eduction-pipe

G, G, is attached; the steam-pipe D, D, and eduction-pipes G, G, are joined to the cylinder by means of screws and cements, or any other of the well known contrivances now used for that purpose. On each of the two nosles 1 and 2, and within the steam-pipe D, D, is attached a smooth face of cast-iron or other metal having an aperture in it large enough to enable the steam, conveyed by the steam-pipe D, D, immediately to fill the cylinder A; the smooth part of the face standing from the cylinder. These faces may be attached with bolts or screws; a method, however, which is hereafter described, is preferable. These faces of cast-iron or other metal are designated in fig. 3, as B, B, attached to 1, with its aperture 11; and C C, attached to 2, with its aperture 12, and their thickness will vary according to the power of the engine in which they are to be used.

Upon these faces two flat slide-valves or shutters S and T, of cast-iron or other metal, move either conjointly or separately, by means of stalks or spills, working through a stuffing-box, either above or below the slide, the said slide being furnished with a knuckle-joint at its upper or lower end where it is attached to the stalk or spill, by which means it is connected with the said stalk or spill so freely as that the valve may have free motion to move off the face independently of the spill or stalk. Other contrivances may be used, to give direct motion to the slide-valve, but the above is the best: but in whatever way the movement is given, it is quite necessary that the said steam slide-valves should have this freedom of motion.

These slide-valves or shutters, by being moved over the aperture in the faces, will effectually prevent the steam from entering into the cylinder, and by moving them off the said apertures, the steam will immediately fill the cylinder, either at top or bottom, as the case may require, the steam being conveyed from the boilers by the steam-pipe D, D, attached to the nosle, branches, or passages of the cylinder, A; and the pressure of steam in the boiler will always keep the sliding-valve close to the face upon which it moves.

For the exit of the steam from the cylinder, two similar slide-valves, P and Q, are employed, moving on two faces, E, E, and F, F, with apertures in them, as marked respectively 13 and 14, one for the top and one for the bottom of the cylinders (see fig. 3): but with this difference, that instead of the faces, upon which the slides move, being fixed to the nosle, branch, or passage of the cylinder, with their smooth surfaces directed from the cylinder, the said faces, E, E, and F, F, are attached to the eduction-pipe, G, G, and stand with their smooth surfaces towards the cylinder, or are otherwise so placed that the pressure of steam within the cylinder, shall press the slide-valves close to the faces upon which they move. These two slides may also be moved conjointly or separately, at pleasure, to allow the steam to escape, either from the top or bottom of the cylinder, as may be required; and thus, by alternately opening and closing the apertures, 1 and 2, and, in like manner, the apertures 3 and 4, on the said slide-faces, by an eccentric rod or any of the means or contrivances commonly used, the steam will produce its required effect upon the piston. A direct motion may be given to these slide-valves, in the same way as described for the steam induction slide-valves; but it is not necessary that the eduction slide-valves should have a knuckle or moveable joint, where they are attached to the slide-spill or stalk, as they are not required to move off their face during the working of the engine. It is not absolutely necessary there should be two distinct slides and faces within the induction-pipe D, D, as above described. In small double action steam-engines, the two steam passages in the induction-pipe may be brought so close to each other that one steam-slide will answer the purpose, the slide working over two apertures instead of one; but still as regards the eduction-slides and faces, upon which they move, they must be arranged in the manner before described; and for single action steam-engines, the steam slide-valve, the equilibrium slide-valve, and the eduction slide-valve, must also be arranged in the manner hereinbefore described, by which each valve will be pressed upon its face by the simple pressure of the steam, and all of them may be made to act separately or conjointly, as may be deemed advisable.

Messrs. Seaward's method of attaching the slide-faces to the cylinder or eduction-pipes, and the mode of d

ng them is as follows:—The steam-D, D, and the eduction-pipe G, G, ; securely bolted and jointed to our nosles, branches, or passages of cylinder A, have spaces as marked ., Y, Z, left in them, opposite each , branch, or passage of the cylinder, ceive the slide and slide-valve. The slide-faces being placed in the said s with their backs against the nosle, h, or passage of the cylinder are y keyed with folding keys or wedges arked 9 and 10, in fig. 4), which is larged vertical section, and are also at 9, 9, and 10, 10, in fig. 5, which enlarged horizontal section of the slide-face and nosle, branch, or ge: these keys press on the slide-and against the steam-pipe, which the face close to the cylinder, , branch, or passage, a dove-tail being left at each side, as marked 6, in fig. 5; and a plain caulking at the bottom and back of the said face, as marked 7 and 8, in fig. 4; then firmly jointed or caulked with is commonly known by the name of packing, or other substances im-ous to steam; those having a de-of elasticity in them are best. This will remain perfect so long as the remain in their places; conse-tly, should it be necessary to re-the slide-face, it can always be in a few minutes, by driving back vedges, the dove-tail form of the permitting the slide-face to be detached from the packing upon it has been pressed by the folding or wedges. The same description es equally to the manner of fixing duction slide-faces, excepting that smooth surfaces are reversed, as e stated, and are keyed with their from the cylinder, and pressing st the eduction-pipe G, G.

. 6, is a vertical section, on an en-d scale, of the space marked W, in , in the induction steam-pipe, D, D.

e Report of the English Govern-'s Engineers on these valves was so actory, that the Lords of the Ad-ty ordered Messrs. Seaward to two pair of engines, each of 140-power, for her Majesty's steam "Volcano" and "Megæra," which ow *running on the Mediterranean n; also subsequently* for the "Gor-*320-horse power*; "Dasher," 100-horse power; and "Widgeon," 90-horse power.

The following letter was received by Messrs. Seaward from the commander of the "Volcano," which in May last made the quickest voyage from Falmouth to Malta and back, upon record:—

Her Majesty's steam vessel, Volcano,
Falmouth, 7th July, 1837.

"Dear Sir,—I have great pleasure in bearing testimony to the excellence and efficiency of your patent slide valves, fitted to the Volcano's engines. My chief engineer reports very favourably of their good qualities, he says, they are very easily handled, require no packing, and are of great utility in long voyages, the vacuum being the same at the ending as at the commencement of the voyage; they also offer great facility in reversing the engines, and from their simplicity and easiness of access, he considers them of great advantage to marine engines; as far as my judgment goes, I perfectly coincide with him, and am very happy to have it in my power to forward so favourable an account of their utility.

I remain, dear Sir,
Your most obedient servant,
(Signed) WM. MC. ILWAINE, Lieut and Com.

The following extract of a letter received from Mr. John Sinclair, engineer of the Russian steam vessel, the "Naslednik," dated from St. Petersburgh, October 1835, is interesting:—

"I have great satisfaction in stating to you the manner in which the engines are performing their duty; the engines work at (in fine weather) 25 strokes per minute, the barometer standing at 28 deg., the same at the end of a passage of 500 miles, as at the time of starting, which plainly shews the advantage of these slides and pistons in a long voyage; we have likewise plenty of steam; I have taken an exact account of the coals, I mean the quantity that we have consnmed between Dantzic and St. Petersburgh, that is 500 miles in 72 hours, with a strong head wind all the way; we burned about 12 cwt. per hour,* which I consider very little for engines of that power, in fact, the slides and pistons, and I may say the engines altogether are doing their duty in a very superior style."

The whole of the engines of the Gravesend vessels, belonging to the "Diamond" Company have been fitted with Messrs. Seaward's improved valves; as have many others engaged in home and foreign trade, and in all has their operation given perfect satisfaction. Indeed every one acquainted with the working of steam engines, especially marine, would be convinced from the description of the invention alone, without any testimonials of performances, that the improvements are most valuable, and the more so because they are effected by means most simple.

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* Equal to about 8⅔lbs. of Russian coals per horse per hour.

THEORY OF TANNING.

Sir,—I am glad to see that different processes of tanning begin to engage the attention of your correspondents, and particularly that of intelligent men, like Mr. William Herapath. Such persons, when right in their views, are likely to lead others right; and, when wrong, are far more likely to be convinced of their error, than men of less information and acquirement.

Having paid the closest attention to Mr. Herapath's reasoning as to tanning by transfusion, it appears to me that it is completely refuted by his own statements. His objections are two. That leather so tanned will be permeable to water; and that it will want weight. He says that the liquor forced through the skin will only pass through certain sets of pores, and will leave the rest untanned; but he immediately adds, that, in consequence of this, the leather will be *permeable water*. Of course he means that water will pass through the pores which the liquor has not reached. How is it then, if they are permeable to water, that they are not permeable to the tanning liquor? And how is it that in the ordinary way of tanning, the liquor reaches these unapproachable passages? Does the pressure by which, in my process, the liquor is driven through the skin, render it more difficult for it to find its way, than when it has no such assistance? Besides, leaving Mr. Herapath's own statements, I beg to furnish him with two facts. One, that my leather, to all appearance, so far as the most experienced eye can judge, is tanned as well in one part as another. The other, that the effect is precisely the same by whichever side of the skin the liquor enters; which, if I rightly understand him, would not be the case on his theory.

Now, as to the tannate of gelatine being forced out of the skin; the white sticky matter on the outer surface of my hides, is as bitter as gall, and will precipitate the gelatine in a solution of isinglass as rapidly as the best solution I can make of tan. This appears to me to indicate tannin rather than tannate of gelatine, and I have no doubt, if Mr. Herapath will do me the favour to come and see it, he will be convinced that it is what I have stated it to be, in my letter to the *Mechanics' Magazine* of the 20th February.

I am much amused at the singular honesty, with which Mr. Herapath proclaims, what he will surely find his customers consider a most serious defect in his leather, its heavy weight. If a piece of leather of a given size, that is, sufficient for a given number of shoes of a certain thickness, would be charged for by tanners in general as 20lbs. weight, but by Messrs. Cox and Herapath as 23lbs, it is quite certain that no one will give the same price per lb. for it, unless he can be kept in ignorance of the extra weight. In my opinion, weight is the last thing to be anxious about—when it is once ascertained. I have ascertained how my leather weighs, and I sell it at a price, which, at the weight, gives me a fair profit. If it weighed more I should sell it at less per lb. If it weighed less I should charge more for it. And if I could not sell it at a price that gave a profit, I would not manufacture it. If any body can deliver a given quantity of leather, of as good a quality, at a lower price, that is, for a smaller sum of money in the whole, he will be a formidable rival to me. The common notion, that the weight of leather is a test of its quality, appears to me to be well founded only when the different specimens are tanned with the same materials. For instance, leather tanned with bark may be as good as it is heavy because the difference in the weight of different specimens may arise from the different quantities of bark put into them—the material being the same, and the quantity only varying: but when leather tanned with bark is compared with leather tanned with terra japonica, or any other material, this test of quality may or may not hold good. The skin may be equally saturated with one or the other, but one substance may be lighter than the other, and this may have nothing to do with the useful qualities of the leather. To compare the different products, merely by their weight, is like judging of different fabrics, such as caoutchouc, leather, cloth, &c., by the same criterion.

I am surprised that Mr. Herapath should make it an objection to tanning by transfusion, that it is a *quick* process, and therefore must injure the leather. Does not the same objection apply to his own? He says he tans in 21 days.

Your obedient servant,

F. CHAPLIN.

Bishops Stortford, Feb. 27, 1838.

THE TREFFOS PUMP—MR. EVANS'S REPLY TO MR. HANSON.

Sir,—Having just seen in your last number, Mr. Hanson, of Huddersfield's letter, on the subject of the treffos pump, I take an opportunity of saying a few words in reply, especially as he has expressed an opinion, founded on practical experience, differing from mine, on the above subject.

Mr. Hanson after stating a favourable opinion upon the introduction of a treffos, particularly in pumps of long draughts, and consequently having much friction to overcome, says, that he invented one differing from Mr. Williams's, inasmuch, as it had no valve, screw cap, &c., and instead of a ¾-inch suction pipe, entailing a loss of power, he employed one 1¼-inches in the bore, to a 3½-inch cylinder, &c. Now Mr. Hanson does not make use of these in his own invention, and condemns them in Mr. Williams's treffos; and if he will refer to my letter on the subject, it will be found that *his objections* were the most prominent ones urged by me, to the success of the application of a treffos to pumps. I, therefore, do submit, that his opinion taken generally, will be more unfavourable than otherwise, to Mr. Williams's invention. On the other hand, I give Mr. Hanson every credit for the method he employed to do away with the *interrupted* stroke of a pump; but I maintain, that it is from the want of employing the due proportions in their manufacture originally, that at any time renders necessary such artificial aids, and which may always be avoided by increasing the area of the suction pipe, as you increase the length of draught; so as to neutralize the additional friction, caused by the increased surface travelled over by the fluid. As Mr. Baddeley justly observes on the subject, "provided the feed pipe is large enough to allow the water to ascend with freedom, the weight equivalent to the altitude of that column, is all that has to be sustained by the piston; but if the feed pipe be so much diminished either with or without the intervention of a treffos, as to create a great deal of friction, and thereby retard the rising of the water, the piston during some portion of very stroke, will be acting against a *vacuum.*"

Mr. Williams has very politely forwarded *me a supplement to his* first description of his pump, and particularly suggests the more favourable results which would follow its employment, (as Mr. Hanson has used it,) for long trains of suction pipes, as applicable to steam-engine purposes, &c. I am fearful, however, that the steam-pump, will scarcely have sufficient patience for his neighbour treffos, *to fill;* the former, being such an interminable drinker. I do not think the treffos so applicable to steam pumps, perhaps, as to domestic pumps.

I am, your's very faithfully,
RICHARD EVANS.

Manchester, Feb. 24, 1838.

P.S.—In your number (753,) there is a paragraph, stating the first Mechanics' Institution in Wales, to have been founded two years ago at Aberistwyth. This I assure you is not correct, inasmuch as it was at *Swansea* in 1826, that the first Mechanics' Institute in Wales was formed: it consisted (at one time) of about 200 members with the late J. H. Moggridge, Esq., as their president; but I am sorry to say, it remained in existance scarcely two years.

NEW HOUSEHOLD MACHINE—HONORARY FIRE BRIGADE OF SOUTHAMPTON.

Sir,—Mr. Crummell not having favoured us with any particularly account explanatory of the constructive of his "new household machine," referred to at page 327; it is scarcely possible to furnish him with the plan he solicits, for so adapting its varied powers, as to add to its multifarious applications that of a *fire-engine.*

The *modus operandi* of "a man working it backward and forward" does not appear at all suitable for this purpose, either as regards obtaining a supply of water—or the delivery of the jet; and from the fearful complexity of the machinery, as described by Mr. Fox, at page 354, it would appear to be already so completely overburthened with work, that it would be unwise, to add the weight and incumbrance of a fire-engine, with all, its etceteras.

Mr. Fox refers in his letter to a fire-engine recently received from London, respecting which, the following particulars will be read with some interest:—

In consequence of the disastrous circumstances attending the late melancholy fire at Southampton, which have been attributed, in some measure, to the want of skill aud activity on the part of the firemen, an " Honorary Fire Brigade," has been formed by several of the inhabitants (mostly members of the yeomanry corps), who have been presented with a very splendid and powerful fire-engine, by the Sun Fire Office, for whom it has been built by Mr. Tilley, Blackfriars-road. This engine is furnished with a set of the improved portable fire-ladders and every other requisite for affording the most prompt and effectual assistance at all future fires in this town or its vicinity. The formation of similar "Honorary Fire Brigades" in other provincial towns, would tend materially to reduce the extent of damage by fire, and stimulate the *regular firemen* to exert themselves in a proper manner when a conflagration occurs, and also to hold themselves and their machinery in readiness for actual service, at a very short notice.

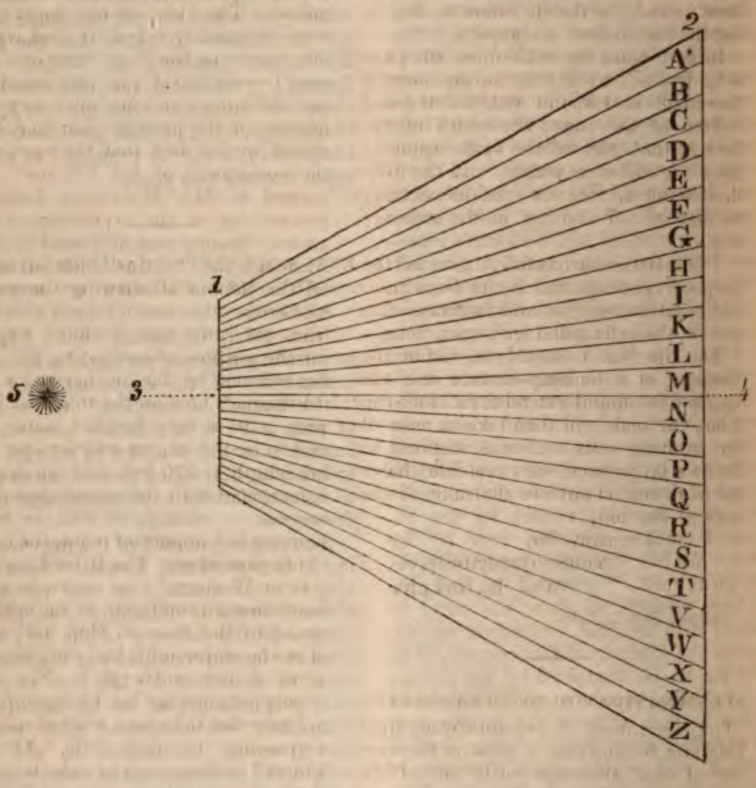
I remain, Sir,

Your obedient servant,

WM. BADDELEY.

London, Feb. 24, 1839.

SCALE OF ALPHABETS FOR BOOKBINDERS.



Sir,—The accompanying diagram will explain the construction of a simple instrument which I devised " a long time *ago,*" *for the purpose of cutting alpha*bets in the margin of ledgers, &c. In the ordinary way, this is effected by separating the depth of the page into twenty-four equal parts, by means of a

pair of dividers. Although continual practice, in this as in every other handicraft operation, gives considerable skill, yet, under the most favourable circumstances the operation is always a tedious and troublesome one, especially if the workman is in a hurry; "the more haste the less speed." By means of "the scale" the page of any book, whether regular or irregular in size, may be instantly divided into any required number of parts.

To make an instrument of this description, take a good stout milled-board covered with white paper, and with the two perpendicular lines Nos. 1 and 2, bisect the horizontal line 3 4. Divide the perpendicular No. 2, into twelve equal parts both above and below the horizontal line. From the centre No. 5 draw 24 radii to the divisions on No. 2, and the instrument is complete.

In use, place the scale upon the page to be divided, so that the top and bottom lines shall correspond with the top and bottom of the page; the width of the lines at that part of the scale instantly gives the distance sought, and the dividers being set thereto, the leaves may be marked off and cut in the ordinary way.

The instrument has fully answered the purpose contemplated in its formation, and greatly simplifies and facilitates this part of the vellum-binder's operations.

The line No. 1 should be within the compass of a foolscap-octavo, and the longer line should extend to full foolscap folio; the scale will then take in most of the running sizes. If it is required to divide a larger page, say royal folio, halve the page and count two divisions of the scale as one only.

I remain, Sir,
Your's respectfully,
WM. BADDELEY.

London, Feb. 17, 1838.

STEAM NAVIGATION OF THE ATLANTIC.

The experiment of a steam voyage from England to America is now on the very eve of trial, although not by any of the competitors who have been so long in the field. It is announced that the *"Sirius," a steamer which, we believe, has been for some time on the station between Bristol and Cork,* will take her departure for New York from the port of London at the latter end of the present month, proceeding in the first instance for Cork, from whence she will start for her final destination on the second of April; and so confident are her owners that her voyage, which they expect will be completed in 15 days, will prove a short one, that they already announce her setting out from New York for the return-voyage on "the first of May." The "Sirius" is a vessel of 700 tons, with engines of 320-horse power, and it does not appear that she is to be prepared in any very peculiar manner for a voyage so much longer than she has ever been accustomed to take, and which is even looked upon by some "learned Thebans" in much the same light, in point of practicability, as a trip to the moon! The idea, cannot, however, be more completely ridiculed than was that of a voyage up the Niger in an iron steam vessel,—yet that was accomplished without difficulty; and perhaps some confidence in the present plan may be inspired by the fact that the agency (not the command) of the "Sirius" is intrusted to Mr. Macgregor Laird, the commander of the expedition in which an iron steamer was first used in Africa. Although the "Sirius" bids fair to carry off the honour of shewing the way, the numerous other steam vessels which have been for some time building expressly for the purpose of navigating the Atlantic, will not be far in her wake. The "Victoria," now on the stocks at Blackwall, is in a very forward state: she is said to be the largest steamer ever built; her length is 270 feet, and she has been constructed with the utmost possible attention to solidity, as well as to that scarcely less important point, the comfort of her passengers. The Bristol vessel, the "Great Western," is of course in a much more forward condition, as she only came round to the river to ship her engines, after the shipwrights had completed their work at her native port. She is now chiefly detained for her fittings-up, which are intended to be on a scale of splendour surpassing even that of the "New York Liners" (sailing vessels), which have hitherto been looked upon as models of the superb style in passenger ships. Some idea may be formed of the spirit with which this object is pursued from the fact that Mr. Parris, the artist of the

panorama of London at the Colosseum, and of the "Flowers of Loviness" and other popular collections, is busily engaged in decorating the walls of the saloons with exquisitely-finished paintings from his own original designs. Besides these ships from London to Bristol, there are at least two preparing for the same purpose at Liverpool, one built entirely of cast-iron; and the whole are expected to be ready for the voyage before the spring is far advanced. Nor is Brother Jonathan idle (although farther in the back ground than customary, like Liverpool, which had to take a lesson on this subject from her usually dilatory rival, Bristol;)—an immense steamer for the voyage to Europe has been for some time in preparation at New York, and is to be fitted with engines on a new construction, which, according to their inventor, are quickly to supersede all that are now in use.

ON HYDRAULIC AND COMMON MORTARS. BY GENERAL TREUSSART, INSPECTEUR DU GENIE.

[Translated from the French by J. G. Totten, Lt. Col. of Eng. and Brevet Col. United States Army, for the *Franklin Journal*.

(Continued from page 329.)

ART. III.—*Experiments on several hydraulic limes of the environs of Strasburg, on the Metz lime, and on Boulogne pebbles.*

When I was sent to Strasburg in 1816, they were in the habit, there, of using fat lime only. One of the two dikes enclosing the navigable canal which passes from the town to the Rhine across the ditch of the place, requiring repairs, I had occasion to remark that while the two facings, which were of cut stone, were much disjointed, the interior of the dike, which was a mass of concrete, was in good condition, and not a drop of water passed through it. The concrete being very hard, and, as it seemed, not made of brick, or tile dust, I conjectured that it had been composed of hydraulic lime, and I made researches accordingly. I learned that the Millers along the Bruche had used, for a long time, in the repairs of their works, a particular species of lime, which they obtained from a village, at the foot of the Vosges, called Obernai.* Mr. Mossère, engineer of roads and bridges, told me that he had used this lime in the works of the canal of "*Monsieur*," and that he was well satisfied with it; and, on making the assay, I found it to be eminently hydraulic: it appeared to me to be in no respect inferior to the Metz lime, which I had seen employed with success, at that place, in 1800 and 1801. At other stations, I had several times made hydraulic mortars of fat lime and brick, or tile, dust. At the great works of Vésel, where I was employed three years, considerable use was made of trass, which was brought from Andernach by the Rhine; and on the experience I had acquired of hydraulic limes, I introduced the use of the Obernai lime in all the constructaions of the works of Strasburg, both in and out of water. I have already observed that all the revetments comprised between *porte de Pierre* and *pont Royal*, giving a development of about 1650 yards, were made with hydraulic lime. Later researches have shown me that hydraulic lime is to be found at the foot of the Vosges, from Belfort to Vissembourg. I shall give experiments which I made with hydraulic lime from Altkirch, Obernai, Rouxviller, Ingviller, Oberbronn, Verdt, &c.

There are no certain means of knowing by inspection whether a lime-stone will give fat lime or hydraulic lime, for there are hydraulic lime-stones of several colours: those of Alsace are generally of a slate blue, like those of Metz, but those of Altkirch, and the hydraulic chalk of Vitry are white; the Boulogne pebbles, and the English-limestone of which Parker's cement is made, are red. I may say, however, that when a lime-stone is blue, it is a presumption that it will afford hydraulic lime. It is remarkable that in lime-stone giving fat lime, the iron exists as red oxide, while it exists in the lowest state of oxidation in a great proportion of the hydraulic lime-stones, even when left for a long time exposed to the air; the same thing happens with good slate, and it seems to me to be owing to the presence of clay in the hydraulic lime-stones and in the slate, with which the iron is probably in combination. As I have before said, the Boulogne pebbles, and Parker's cement stone, were exceptions; but this might be due to some peculiar cause; the sea-water might have some influence on the oxidation of the iron contained in the Boulogne pebbles.

All the blue hydraulic lime-stones which I have caused to be calcined, gave a yellow ochre colour whenever the heat was not great. If the calcination was raised, the colour passed, successively, to fawn, ash-gray, and, finally, if the heat had been very great, to slate blue. I cannot satisfy myself

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* *This village is situated between Schelestadt and Strasburg: upon the map of Cassini it is written Ober-Ehnheim, but it is pronounced Obernai, and is so written on some maps.*

as to the cause of the blue colour which the lime-stone takes by a high calcination, because it seems necessary to suppose that this effect is the bringing back of the iron to its first degree of oxidation, which is possible, but does not seem to me easy to explain.

A like effect appears to take place in the calcination of clays that contain oxide of iron. Some clays submitted to calcination are blackish, because of the iron being present at the lowest state of oxidation: at a certian degree of heat, the iron passes to the state of red oxide, and the clay takes the decided colour commonly seen in bricks: if the heat be augmented, the red colour weakens, and becomes fawn or straw colour; if the heat be pushed to a high degree, the clay becomes of an ash colour and afterwards of a very decided slate-blue colour—the iron having then lost a great part of its oxygen. If slate, and the clay just described, be calcined at the same time, the iron will pass with much more difficulty to the state of red oxide in the slate than in the clay. The degree of heat necessary to bring the iron in the slate to the condition of red oxide, will have caused the iron in the clay to pass through all the stages of oxidation before mentioned, and have imparted the blue colour to the clay. Are these different phenomena due to this, that while, in the slate, the iron is combined with the alumine, there is no such combination in this clay? In clays which are strongly calcined, has the alumine the property of abstracting the oxygen from the iron? It is for chemistry to clear up these points.

M. Berthier has given the following method of detecting hydraulic lime-stones. "The stone must be pulverized and sifted through a silk sieve: 10 grammes of the powder being put in a capsule, muriatic acid, diluted with a litte water, must be poured on, little by little. (In want of muriatic acid, nitric acid, or even vinegar, may be used.) The whole should be constantly stirred with a glass or wooden rod, as long as there may be any effervescence; this having ceased, the solution must be evaporated, in a gentle heat, to the consistence of paste; about one pint of water must be added and the whole filtered; the clay will remain upon the filter; it must be dried in the sun or before the fire, and weighed; or, still better, it must be raised to a red heat in an earthen, or in a metallic crucible before being weighed; limpid lime-water must then be thrown into the solution, as long as it forms a precipitate therein; this *precipitate should be separated*, as soon as *possible, by the filter; it is magnesia* (*sometimes mixed with iron* and manganese;) it should be washed with pure water, and dried at a high heat before taking its weight." The weight of the clay retained by the filter, compared with the weight of the lime-stone, will indicate whether it be hydraulic lime-stone or not. But it might happen that the substance remaining on the filter would be all sand; this may be determined before drying; for if it be sand only, it will be rough to the touch, while if it form a soft and ductile paste, it will be clay, that is to say, a mixture of alumine and silex. Besides, by drying at a high heat, it will be seen if a compact mass be obtained, which, will be the case with clay highly heated, or if it be pulverulent matter, which will show that little or no alumine is present. As to the rest, we do not yet know accurately, in what proportions the silex and alumine ought to be present to constitute the best hydraulic cement. The best manner of ascertaining whether a lime is hydraulic, is the following: take quick lime as it comes, properly calcined, from the kiln; reduce it, with water, to a thick paste, and place enough of it on the bottom of a tumbler to fill it for one-third or one-half of its height; three or four hours after, fill the tumber with water, and leave all at rest; after two or three days, touch the lime lightly with the finger, to ascertain whether it begins to harden: if it be very hydraulic, it will have taken, after eight or ten days, such a consistence, that no impression can be made on the lime by pressing strongly with the finger. We should assure ourselves whether there has been, in fact, no impression, by throwing off the water and washing the surface of the lime, which will be covered with a thin layer of lime softened by the immediate contract of the water. If the above result be obtained only at the end of twenty, thirty, or forty days, the lime should be regarded as only feebly hydraulic, and if there be no consistence in the lime after the lapse of about forty days, it cannot be regarded as at all hydraulic. This process, which is very simple, is that which I always follow—it was indicated by Mr. Vicat.

Before giving my first experiments, I will explain the processes I followed, both, in making mortars, and in breaking them in order to determine their tanacity. In my first experiments, I fixed the proportions of my mortars, by slaking the lime to dry powder with one-fifth of its volume of water, and measuring this lime in powder. Afterwards I measured the lime in paste, in order to approach the mode ordinarily pursued in practice with fat lime. I shall take care to state in every instance, which of these modes of measurement I followed. When I had united the lime to its proper propor-

tion of sand, or other substance, I mixed them well together, adding water, till the consistence was like honey; and I passed the mortar seven or eight times under the trowel. The mortar being made, I put it in wooden boxes which were six inches long by three inches wide, and three inches deep, leaving them in the air for twelve hours, so that the mortars might be somewhat stiffened. They were then placed in a cellar, within a large tub filled with water. I examined the mortars from time to time, and noted the number of days required to harden. I called the mortars hard, when, on pressing them strongly with the thumb, no impression was made on the surface. All the mortars were left in the water one year; at the end of which time they were withdrawn, and I scraped off the four sides or faces with the chisel of a stone cutter until nearly half an inch was removed, when they rubbed upon a stone until they were reduced to parallelopepids of 6 inches long by 2 inches square. By means of a wooden form which they were made to fit, all were reduced, very exactly, to the same dimensions, and had the four faces well squared. It will be observed that I took off from each side about half an inch, with the view of submitting to rupture only the portion which had not been in contact with water. I ought to notice that in doing this it was often found that the mortars were harder at the surface than in the interior: sometimes the contrary happened. By taking off a portion ($\frac{1}{2}$-inch) from each face, I rejected all that, from any clause had received a dfferent degree of hardness from the interior.

To ascertain the tenacity of mortars, the following process was followed. I adapted two pendant iron stirrups to a horizontal beam. They were placed parallel to each other and distant four inches in the clear—the lower parts being exactly level. On these stirrups, the parallelopepid of mortar which was to be tested, was placed, passing it through a rectangular collar of iron, a little larger than the prism of mortar, and termined below by a hook. This collar exercised its pressure upon the mortar by its upper horizontal bar, of which the transverse section had the form of a rounded wedge; and being brought against a bracket, or check, it was midway between the stirrups. To the hook of the collar was suspended a common scale pan, that was loaded by adding successive weights until the prism of mortar broke—which it did with noise. The weights were then summed up, adding, always 22 lbs. for the weight of the scale pan, cords and collar. In the beginning, as a weight I poured sand into a box placed on the scale pan, but I renounced this method, because it was too slow. I perceived that it was important to beak the mortar promptly; it having several times happened that, when the mortar had supported for some time a weight approaching that which should break it, it would give way, after having taken off a weight of 11 lbs. in order to substitute a greater. On cutting the parallelopepids down to the proper size, I judged nearly of the weight they would sustain; and a weight approaching this was put on at once; after which small weights were added, one after the other, until the mortar broke. When the mortars were capable of sustaining a great weight, I added weights by 10 pounds at a time, because this is a small quantity compared with the total weight, and it is important that the fracture be made promptly. The above are the means I used, and they seem to me to be preferable to any that I have seen described by others. Some have directed that the mortars should be loaded with weights, until crushed; but the moment when they begin to yield is difficult to judge of, as the angles often break before the middle, and it is not clearly seen when the substance under trial has really yielded to the load. Others have directed that the body of which the strength is to be ascertained, be placed at the end of a strong table to which it is to be fastened; a scale pan is then to be suspend from a portion projecting a certain distance from the table, and weights are to be added till rupture occurs; but it is to be feared that the mortars, or the stones, submitted to this trial, will sometimes project a little more, and sometimes a little less; the weights acting thus at the extremity of unequal arms of levers, will give different results for substances that should exhibit the same tenacity; it is also to be feared that fastening the mortars more or less stifly will influence their resistance.

Mr. Vicat, to judge of the resistance of mortars, employed the following method—reported in pp. 34 and 35 of his memoir: he lets fall upon the surface of the mortar, from a height of two inches, a rod of steel slightly conical, and terminated at its end by a plane surface 0.066 inches in diameter: this rod, loaded with the weight of $2\frac{2}{10}$ lbs., penetrates a certain distance into the mortar, giving, thereby, the relative hardness.

As it is the resistance that mortars oppose to steady or unimpulsive forces that it is important to know, he thought he might conclude, from some experiments that he reports, that "the squares of the numbers which express the penetration of the rod are reciprocally proportioned to the resistances to the force which tends to break the mortars." On this principle he has transformed, by calculation, the penetration of

the rod, into numbers proportional to the resistances. I must make, however, on this subject, the following observations.

1st. It is difficult to appreciate exactly the penetration of the rod. 2nd. It does not appear to me to be proved, by the few experiments given by Mr. Vicat, that the squares of the numbers expressive of the penetration are always reciprocally proportional to the resistances: 3rd. If the rod fall on a grain of gravel, or on a large grain of sand, or even on a grain of lime, we should be liable to infer, from the penetration, conclusions altogether inaccurate as to the resistances of the mortars: 4th. The rod is permitted to fall on the surface of the mortar, and it often happens, as before observed, that the hardness of the surface differs much from that of the interior.

All these causes of error united have conducted Mr. Vicat to conclusions which are sometimes entirely opposite to results obtained in my experiments; I shall take pains to point these out as they present themselves. It will be noticed that to determine the resistance of mortars, I have no calculations to make; by the means I employed, these determinations were perfectly independent thereof, and I have only to enter in the table the number of pounds the mortars are loaded with at the moment of rupture.*

I am now about to present the first results of the experiments made with Obernai lime, and with other hydraulic limes of the environs of Strasburg. The Obernai lime being that which was most often used at the works, I sent a specimen to Mr. Berthier, who analysed it, with the following results; Lime, 0.422; magnesia and iron, 0.050: silex, 0.105; alumine, 0.043; carbonic acid and water, 0.380. This lime-stone differs but little from that of Metz, which contains as follows: lime, 0.445; magnesia and iron, 0.067; silex, 0.053; alumine, 0.013; carbonic acid and water, 0.412; loss, 0.010.

Observations on the experiments of Table No. II.—(For table, see next page.)

To make the above mortars I took lime as it came fresh from the kiln, and slaked it to dry powder by throwing on one-fifth of its bulk of water; I left it in this state for twelve hours, and then, having measured the powder, I added the quantity of water necessary to reduce it to paste. I afterwards added to the lime the several quantities of sand and of trass indicated in the table, and I, in all cases, mixed the constituents until a homogeneous mortar was obtained, which required that it should pass six or eight times under the trowel. The mortars were made of the consistence of honey, and were put in the small wooden boxes before mentioned; being lightly compressed with the trowel and the hand, they were left in the air during twelve hours: they had then somewhat stiffened, and in this state were placed in a cellar, in a large tub filled with water. I took care to examine them from time to time, and to note the number of days they required to harden to such a degree that on being strongly pressed with the thumb, no impression was made. At the end of a year they were withdrawn from the water and were broken in the manner described, page 380. In order to institute a comparison between the resistance of my mortars and the building materials of the country, I broke, in the same manner, parallelopepids of bricks, having the same dimensions; the average of the common brick of the neighbourhood of Strasburg, gave me 462 lbs., as is expressed in the table; but the refractory bricks of Sufflenheim, are much stronger, and gave 572 lbs.

As I have before remarked, the Obernai lime is yellow when not fully calcined; when a little more burned it is of a dirty yellow; afterwards it passes to ash-gray; and, at last, when too much burned, it is of a slate blue, and pieces of vitrified lime are often found. The lime being burned with wood, it is difficult to obtain a uniform calcination; there are always some pieces of lime too much, and others too little burned. Care was taken to reject the pieces of both extremes; but the mortar made at the works always contained, notwithstanding, lime of the three colours mentioned. If the lime-burners would burn their lime for a little longer time, making a less intense fire, they would not consume more wood, and would give better results. But it is difficult to change usages.

The object of the experiments of Table No. II. was to know the degree of calcination which is best, and the quantity of sand most proper to mix with the lime. In table

* Since the first part of this memoir was written I have seen a new memoir of Mr. Vicat's, in which he says, page 117, "We thought ourselves entitled to conclude from a certain number of experiments described in our first work, that the squares of the numbers expressing the penetration of the rod, falling with a given weight, are reciprocally proportional to the relative or absolute resistances of the substance; and, on this principle, the penetrations were transformed by calculation into numbers proportional to these resistances. But, in accordance with the very judicious observations of Mr. Vauthier, engineer, we have decided to return to the numbers which express the penetration."

I will again observe that it is the tenacity of mortars submitted to unimpulsive or steady forces which it is important to know, and that this will not be obtained by numbers which express the penetration of a rod submitted to an impulsive force.—*Au.*

Table II.

No. of the mortar.	Composition of mortars.			Number of days required to harden in water.	Weights which they supported before breaking.
	Common bricks of Strasburg................				462 lbs.
	Refractory bricks of Sufflenheim				572
1	Yellow Obernai lime alone in paste*			8	372
2	Ditto ditto ditto slaked to powder and measured in powder†..................	1	$2\frac{1}{2}$	10	224
	Common sand	$1\frac{1}{2}$			
3	Lime the same.........................	1	3	12	253
	Sand the same	2			
4	Lime the same.........................	1	$3\frac{1}{2}$	12	176
	Sand the same	$2\frac{1}{2}$			
5	Lime the same.........................	1	4	14	92
	Sand the same	3			
6	Lime the same.........................	1	3	4	429
	Sand the same	1			
	Trass.................................	1			
7	Lime the same.........................	1	3	4	299
	Trass.................................	2			
8	Gray Obernai lime alone, in paste............			8	354
9	Ditto ditto ditto slaked to powder and measured in powder.....................	1	$2\frac{1}{2}$	10	400
	Common sand	$1\frac{1}{2}$			
10	Lime the same.........................	1	3	10	422
	Sand the same	2			
11	Lime the same.........................	1	$3\frac{1}{2}$	12	187
	Sand the same	$2\frac{1}{2}$			
12	Lime the same.........................	1	4	15	106
	Sand the same	3			
13	Lime the same.........................	1	3	4	473
	Sand the same	1			
	Trass.................................	1			
14	Lime the same.........................	1	3	4	328
	Trass.................................	2			
15	Blue Obernai lime alone, in paste			20	275
16	Ditto ditto ditto slaked to powder and measured in powder.....................	1	$2\frac{1}{2}$	14	136
	Common sand	$1\frac{1}{2}$			
17	Lime the same.........................	1	3	15	154
	Sand the same	2			
18	Lime the same.........................	1	$3\frac{1}{2}$	16	117
	Sand the same	$2\frac{1}{2}$			
19	Lime the same.........................	1	4	18	79
	Sand the same	3			
20	Lime the same.........................	1	3	5	378
	Sand the same	1			
	Trass.................................	1			
21	Lime the same.........................	1	3	5	339
	Trass.................................	2			

* *The lime of* the hydrates No. 1, 8, and 15, is not of the same burning as the lime of the mortars of *the Table. Au.*

† *I must premise that* by the expression, *slaked to powder*, often used in the Tables, must be understood, *lime which* was slaked as it came from the kiln, with only a small quantity of water, to reduce it to *dry powder.* As to lime reduced to dry powder by being left to spontaneous slaking in the air, it is called *lime slaked in the air*, or *air-slaked lime.* I sometimes use in the tables the sign + signifying more, and the sign — signifying *less.—Author.*

No. I. where I operated with several kinds of lime, I slaked them to dry powder with a bulk of water equal to half the bulk of lime; but the Obernai lime is well reduced to powder with a fifth of its volume of water. With this quantity there is obtained, moreover, nearly the same volume of lime in powder, as when slaked with the half of its volume of water. In fact, 0.005 of yellow Obernai lime reduced to powder and slaked with one-fifth of its volume of water, gave 0.0105 of lime in powder, and, consequently, 1 part would give 2.10, a result differing little from that of table No. 1.

Table No. II. shows that lime-stone which had been calcined so as to yield a lime slightly gray, was that which gave the best result; that which was blue was slow to slake; when reduced to paste it formed with sand and with trass, a mortar susceptible of swelling considerably, because of its preserving, even in this state, the property of absorbing water for a long time. All the boxes containing mortar made of blue lime were totally disjointed by the enlargement of the bulk of mortar. I was not, at first, aware of this effect, and having caused a coat of rough-cast, composed of Obernai lime and sand, to be applied to one of the Government buildings, I was surprised, after five or six months, at seeing, on many points of the surface, swellings of the size, nearly, of a half dollar; these portions finally fell off, and it was then seen that they had been caused by particles of blue lime, about the size of a pea, that were beneath. These particles had not had time to slake thoroughly; and, as imperfectly slaked lime has a strong avidity for water, they absorbed water from the air, and increased in bulk. The force must have been great to break the very hard mortar which covered these particles. This rough-cast has now been on six years; it is very hard, and has perfectly resisted all inclemencies of the seasons. The property which hydraulic lime, too much calcined, has, of swelling considerably after being made into mortar, might be availed of, under certain circumstances. If it were required, for example, to fill cracks in old walls where the hand could not be introduced, or to fill spaces washed from under old foundations, mortar made of highly calcined hydraulic lime might be advantageously used, because the mortar by swelling would more perfectly fill the cavities. But especial care should be taken not to use it in new constructions, as it might cause serious accidents. *It is stated that two locks having been made, a short time since, with lime that had not been sufficiently slaked, the mortar swelled to such a degree that all the cut stone was displaced,* and it was necessary to rebuild the masonry. This accident happened to the works for the improvement of the navigation of the Vésère.

Table No. II. teaches that the yellow lime and the blue lime gave, alone, greater resistances than when mixed with sand. But I ought to observe that no conclusion should be drawn from this, as the three experiments on hydrates were made with lime different from that used in making the mortars of the table. At the time of making these experiments, I was far from thinking there could be so great a difference between mortars made of pieces of lime which seemed to have sustained the same degree of calcination. The best results with the Obernai lime alone are 372 lbs. for the yellow, 354 for the gray, and 275 lbs. for the blue. I regret not being prepared for this superiority of the hydrate over mortars, but I was far from expecting it: otherwise, after having made the experiments with the limes alone, I should have made mortars, by adding successively, $\frac{1}{4}$, $\frac{1}{2}$, $\frac{3}{4}$, &c. of sand, so as to judge better of the effect of sand; but it was only on breaking the mortars at the end of a year, that I could know the effect, and I have often, on such occasions, obtained results that surprised me, and been conducted to new experiments, requiring another year to furnish results.

(To be continued.)

LIST OF SCOTCH PATENTS GRANTED BETWEEN THE 22D JANUARY, AND 19TH FEBRUARY 1838.

William Losh, of Benton Hall, Northumberland, Esq., for improvements in decomposing muriate of soda (common salt,) parts of which improvements are also applicable to the condensing vapours of other processes. Sealed, Jan. 26, 1838; four months to specify.

Thomas Moore, of Ison-green, Nottingham, lace manufacturer, for improvements in machinery for frame work knitting. Jan. 29.

Luke Barton, of Arnold, Nottingham, hosier, for certain improvements in machinery for frame work knitting. Jan. 31.

Ambroise Ador, of Leicester-square, Middlesex, chemist, for certain improvements in producing or obtaining motive power. Feb. 8.

Henry Davis, of Stoke Prior, Worcester, engineer, for certain improved apparatus or machinery for obtaining mechanical power, also for raising or impelling fluids and for ascertaining the measure of fluids. Feb. 9.

David Wilkinson Sharp, of Bingley, York, worsted spinner, for certain improvements in machinery or apparatus for warping worsted, linen, cotton, silk, or woollen yarns. Feb. 9.

James Matley, of Paris, and of Manchester, gent., for certain improvements in machinery for the operation of teiring used in the printing of cotton, linen, and woollen cloths, silks, papers, and other substances in which block printing is or may be applied; in consequence of a communication with a foreigner residing abroad. Feb. 13.

William Palmer, of Sutton-street, Clerkenwell, Middlesex, manufacturer, for improvements in printing paper hangings. Feb. 19.

Ambroise Ador, of Leicester-square, Middlesex, for certain improvements on lamps, or apparatus for producing or affording light. Feb. 19.

NOTES AND NOTICES.

Geneva Jewellery.—The Jeweller Baulte, who lately died at Geneva, was such a proficient in his trade, that he raised himself in the course of twenty years, from the position of a common workman with no property but his industry and ingenuity to that of the master of a business which employed a thousand pairs of hands. The reputation of Geneva jewellery which took its rise from him, has even extended to the East, and it is mentioned as a still stronger proof of the height to which it has attained, that Mr. Baulte, was in the habit of drawing considerable sums from London.

The Chromapolygon.—Sir,—The Italian pattern-drawer, who has been surfeited by an *over dose* of Mr. Mordan's chromapolygons, and evinces so much soreness in his communication at page 353, has no just ground of complaint. The more moderate of her Majesty's lieges, find sixpennyworth (a packet) a *quantum suff.*—P. P.

London Fires.—*Arnott* v. *Baddeley.*—A rich instance of the exaggeration in which enthusiastic inventors are too prone to indulge, is afforded by Dr. Arnott's work, on his thermometer stove, where, in dilating on the danger resulting from the use of open fire places, he amazes his readers by assuring them that in London there are on an average no less than *one hundred and forty* fires per month. The Docter does not give his authority for this statement; and well he might not, since it appears, by referring to Mr. Baddeley's detailed and authentic report, that the total number of fires attended by the brigade in 1837, amounted to *five hundred and one*, or considerably less than *one third* of Dr. Arnott's imaginary average; and even that number was considerably above the usual average of the last few years. So much for the Doctor's "facts"!

Civil Engineers' Transactions.—A second volume of the "Transactions of the Institution of Civil Engineers," is in a forward state, and is expected to be ready for publication in the course of the present season. If the interest of the first volume be sustained by its successors, the series will soon become the most valuable body of practical information contained in the transactions of any society whatever.

Printing in Colours.—Some time ago, certain artists in Paris, pretended to have discovered a method of printing in colours from stone, which it was supposed would be of great importance in the arts. In the end, however, as has been already noticed in the *Mechanics' Magazine*, it turned out that the whole process was a deception, and that the colours were laid on by the hand. The idea, however, has been taken up by more respectable parties, and the well known English lithographers, Messrs. Davy and Haghe, have lately produced some very fine specimens of coloured printing from stone, rivalling in excellence the wood-engravings in the same style by Mr. Baxter, which have excited so much attention and admiration. The English inventors have given their process the exceedingly long ill-compounded name of "Lithochromatography."

Magnetic Moving Power.—In consequence of a report made by the minister of public instruction at Petersburg, respecting the experiments made by M. Jacobi, with a view to the application of electro-magnetism as an impelling power, the Emperor of Russia has ordered that experiments shall be made on the largest scale, under the direction of an imperial commission, with the special object of investigating whether this new moving power can be applied to propelling vessels instead of the steam-engine.—*Monthly Chronicle.*

Decrease of the Baltic.—It has been observed that the waters of the Baltic are undergoing a gradual decrease, which seems to arise from some elevation of the surface of the bottom and coasts of the sea. Ancient marks are traced upon the rocks, which indicatethe fo rmer level of the waters; and these are now considerably above the surface of the sea. The academy of science of St. Petersburgh has called to this subject the attention of Prince Menzikoff, Minister of Marine; and instructions have been accordingly given to Captain-Lieutenant Reinecke, who is charged with a survey of coasts of Finland, to observe with accuracy the present elevation of the existing marks above the level of the sea, and to make new marks in the rocks at known heights, to serve for future observations.—*Ibid.*

New Alloy of Zinc and Copper—A committee of the French academy of sciences is engaged in investigating a new alloy of zinc and copper, which is said to possess qualities which fit it for extensive use in the arts and manufactures. Its cost will be little more than that of zinc. The pure metal of zinc oxidizes with great facility, which renders it unfit for a multitude of uses; the alloy, however, is oxidized with great difficulty. It will resist, for example, sulphuric acid of twenty degrees of concentration. Hence it may be used for mineral waters, for pipes and tubes through which acid liquids flow, and, in navigation, for the sheating of vessels. The composition of the alloy depends on the uses to which it is applied. If it is applied in circumstances where zinc is commonly used, the inventor mixes with a great proportion of the latter metal a small quantity of tin and lead—an addition which does not augment the cost of the alloy more than a farthing a pound. The alloy which is used for boilers, gutters of houses, &c., contains no lead; but still, like the other, resists the sulphuric acid of twenty degrees concentration.—*Ibid.*

Safety of Bonds, Bills, &c.—A large banking-house, which has recently been finished in the first style of architecture, consequent upon the improvement in the city, had an immense pit or well dug many feet below the surface, and made water-proof by substantial brickwork. The mouth of the pit opens in the floor of the bank parlour, but, during the hours of business, is effectually covered by the oaken floor. At the close of the day, and in the presence of the responsible parties, the bank books, bonds, bills, notes, security and specie, enclosed in proper receptacles, are placed on the trap over the orifice of the well, and, by the aid of ingeniously contrived machinery, the property is lowered to the bottom, a depth of about 40 ft., the trap-door is secured, and at the opening of the bank in the morning, the property is again raised to suit the purposes of the day.—*Morning Chronicle.*

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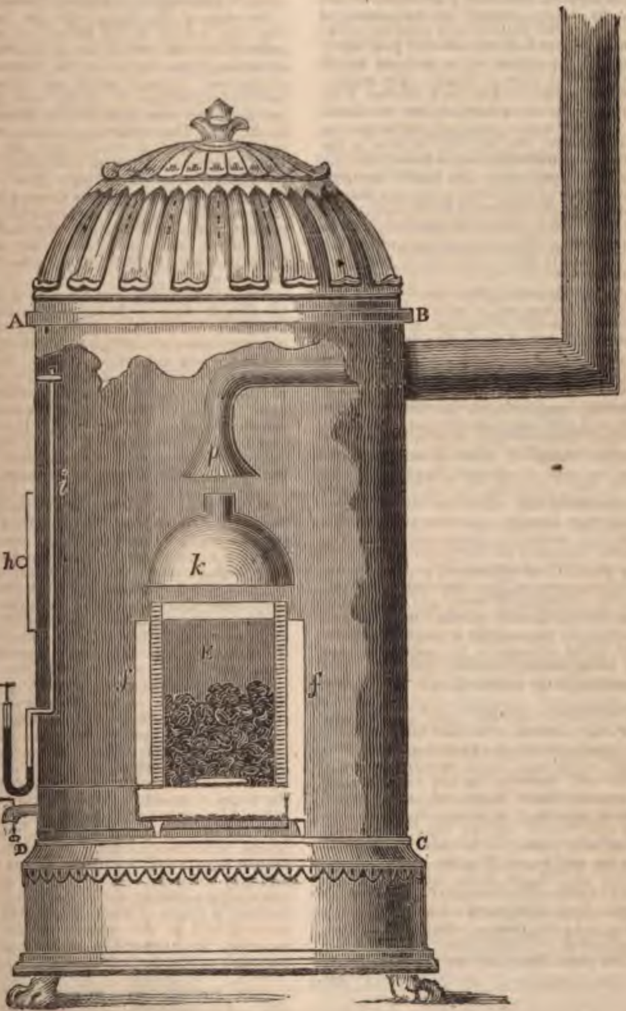
Mechanics' Magazine,

MUSEUM, REGISTER, JOURNAL, AND GAZETTE.

No. 761.] SATURDAY, MARCH 10, 1838. [Price 3*d*.

DR. ARNOTT'S STOVE.



DR. ARNOTT ON WARMING AND VENTILATING.

Not satisfied with the high reputation acquired by his well known work on "The Elements of Physics," Dr. Arnott has again entered the arena of authorship, though his literary effort, on the present occasion, is little other than supplementary to one he has been making in the extensive field of invention.* High-sounding as may be the title of of his five-shilling pamphlet, and wide-spreading as its range of subject may appear, its main or only object is to do nothing more than to point out to the public the transcendent merits of his "Thermometer Stove, or Self-Regulating Fire;" and we are sorry to add that, in accomplishing this purpose, Dr. A. contrives also to effect another; *i. e.*, to make himself thoroughly ridiculous in the eyes of all his readers.

The Treatise, we are told in the preface, "contains the substance of a lecture delivered before a scientific audience at the Royal Institution on the 11th of March 1836, and which is now, by the addition of elementary illustrations, fitted for popular use." The Doctor, then, has taken hard upon two years to add these "elementary illustrations," without which he would not venture to lay the account of his wonderful stove before the public in general. And what, may it be conjectured, do these indispensable illustrations consist of?—"Elementary" they are with a vengeance!—for they comprise, among other equally novel matter, a number of very grave and irrefragable proofs that "neither man nor the lower animals can support life without air," and that "aliment" of some sort or other may be safely considered one of the "necessaries of life"! This, it must be allowed, is very valuable information; but we put it to Dr. Arnott, whether, if it were absolutely necessary that his Lecture should be fitted by this addition for "popular use," it would not have been better to follow the example of his great predecessor, immortalised by Mathews, and give the rabble some rhyme as well as reason: *ex. gr.*

"Sailors often go to sea,—
"On my head I wear a hat,—
"Birch-brooms are not made of tea,—
"Aldermen are sometimes fat.—
"*I'm Simon Bore just come from college,*
"*My studies I've pursued so far,*
"*I'm called, for my surprising knowledge,*
"*The walking Cyclopædia.*"

A few such stanzas as these would agreeably relieve the solemnity of the introduction, and at the same time be quite as much in place as any of the matter at present to be found there. We would advise Dr. Arnott by all means to cultivate his poetical talent, and let us see the result in his next production. Meanwhile we pass on without further parley to "the great *stove* itself," the original cause of all this flood of knowledge being poured forth on the head of the plebeian public (in a five-shilling pamphlet, be it remembered!) We need hazard no apology for quoting the whole of the Doctor's description, inasmuch as he desires it to be as widely known as possible, and has even declined to take out a patent, that the whole world my participate in the advantages it offers, without molestation from the inventor. Here, then, follows the marrow of the book; the "sole jewel" to which the lengthy "elemenentary illustrations" form the costly shrine. The very "head and front" of this grand invention, "hath this extent,—no more:"—

"The outline a b d c represents a box formed of sheet iron, and divided by the partition g h into two chambers, commu-

* *On Warming* and Ventilating, with directions *for making* and using the thermometer-stove, or *self-regulating* fire, and other new apparatus, by *Neil Arnott*, M.D., Physician Extraordinary to the Queen, author of "Elements of Physics," &c. [illegible]a, 1838: Longman, and Co.; 8vo. pp. 146.

nicating freely at the top and bottom. The letter *e* marks the fire-box or furnace, formed of iron, lined with fire-brick, and resting on a close ash-pit, of which *b* marks the door, and near which door there is a valved epening, by which air enters, to feed the fire when the door is shut; *i* marks the door of the stove, by which fuel is introduced; *c* is the chimney-flue. While the stove-door and ash-pit door are open, a fire may be lighted, and will burn in the fire-box just as in a common grate, and the smoke will rise and pass away by the chimney, mixed with much colder air, rushing in by the stove-door; but if the stove-door and ash-pit door be then closed, and only as much air is (be) admitted by the valved opening in the ash-pit as will just feed the combustion, only a small corresponding quantity of air can pass away by the chimney, and the whole will soon be full of the hot air, or smoke from the fire circulating in it, and rendering it every where of as uniform temperature as if it were full of hot water. This circulation takes place, because the air in the front chamber around the fire-box, and which receives as a mixture the red-hot air issuing from the fire, is hotter, and therefore speciffically lighter, than the air in the posterior chamber, which receives no direct heat, but is always losing heat from its sides and back; and thus, as long as the fire is burning, there must be circulation. The whole mass of air is, in fact, seen to revolve, as marked by the arrows, with great rapidity: so that a person looking towards the bottom of the stove through the stove-door *i* might suppose, if smoking fuel had been used to make the motion visible, that he was looking in at the top of a great chimney. The quantity of new air rising from within the fuel, and the like quantity escaping by the flue *e*, are very small compared with the revolving mass. There remains to be noticed the thermometer regulator of the combustion. Many forms presented themselves to my mind, as described in the section on the manufacture of the stove, any one of which will close the air passage, slackening or suspending the combustion at any desired degree, and will open it again instantly, when the temperature falls below that degree."—p. 43.

The engraving on our front page represents one of Dr. Arnott's stoves, with the thermometer-regulator. The outer metallic case or body A B C D, about 20-inches broad by thirty high (which our engraver has made of anornamental form, *with part of the side removed* to show the interior) encloses the fire-pot or grate E, of about 10-inches wide, and 10 or 12 deep. It is lined to the thickness of about 2-inches with fire-brick, which being a bad conductor of heat is to preserve the fuel in an ignited state. The light screen *f f*, is for the same purpose as the partition in the diagram before described, to ensure circulation of air. The dome cover *k*, is to protect the surface of the fire from the approach of atmospheric air, and thus prevent the liability to explosion from the use of wood or bituminous coal. The hot air funnel *p*, is for the purpose of conveying hot air directly into the chimney from the fire, and so diminishing the temperature lower than can be done by the thermometer-regulator, without incurring the danger of extinguishing the fire. The thermomer-regulator is placed at *g*; by the expansion and contraction of the air in the tube *i*, in the inside of the box, by the increasing or descreas'ng heat, the mercury, is raised or lowered in the outer arm of the tube, and a float or piston in the mercury rises or falls with it, and closes or opens a valve which regulates the supply of air to the furnace. The openings in the stoves are *h*, to admit the fuel, a smaller ash-pit door, and the air valve.

We need not at present pause here further than to remark, that had Dr. Arnott taken the *pressing advice of his friends*, and determined on laying out a few hundred pounds on a patent, it would have been rather a puzzling task to furnish a specification which, in legal parlance, would "hold water." After a careful perusal of all the Doctor has to say upon the subject, it would be difficult to say what it is he claims as the essential part of his invention. Sometimes it would appear to be the restricted supply of air; but this idea is as old as the hills, and the Doctor himself describes and figures an American anthracite stove in which the principle is brought into operation. At other times we are called upon to lavish all our admiration on the contrivance for *regulating* the admission of air: but this also is any thing but new, the process being perfectly well known and extensively used, especially in steam-engine machinery. Nay, Dr. Arnott, in this very treatise, ridicules the notion of Dr. Ure, that the patent for his Ther-

mostat, or heat-regulator, can be valid,—and that on the ground of its utter want of novelty! What if it should turn out, after all, that Dr. Arnott's munificent gift to the public—of which so much is made in his preface and elsewhere,—is of much about the same value as a priest's blessing!

But, whover the inventor, come we now to the merits of the stove, a subject on which the Doctor is never weary of dilating. He has postponed the publication of his treatise, chiefly indeed because he would not send it forth without the valuable "elementary illustrations with which it is enriched; but partly, also, that he might speak from experience of its action. Let us see, then, what has been the result:—

"What chiefly surprises a stranger in this new stove, is the very small quantity of air required to support the combustion which warms a large room; the whole might enter by an opening of half-an-inch in diameter, and the quantity of air or smoke which passes into the chimney is of course proportionably small. These facts at once suggest how small the consumption of fuel must be, as that depends on the quantity of air entering, how perfect the combustion of the fuel must be where so little is expended, and how completely the heat produced in the combustion must be turned to account. The combustion is so perfect, because the fuel is surrounded by thick fire-brick, which confines the heat so as to maintain intense ignition; and the saving of heat is proved by the rapidly diminishing temperature of the flue, detected by a hand, passing along it from the stove. During the winter 1836-7, which was very long and severe, my library was warmed by the thermometer-stove alone. The fire was never extinguished, except for experiment, or to allow the removel of pieces of stone which had been in the coal, and this might have been prevented by making the grate with a moveable, or shifting bar. The temperature was uniformly from 60° to 63°. I might have made it as much lower or higher as I liked. The quantity of coal used (Welch stone coal) was, for several of the colder months, six pounds a day—less than a penny worth—or at the rate of half a ton in the six winter months. This was a smaller expense than of the wood needed to light an ordinary fire; therefore the saving *was equal to the* whole amount of the coal *merchant's ordinary* bill. The grate, or *fire-box, fully* charged, held a supply for *twenty-six hours.* It might have been made *twice as large*, or to hold a supply for two days, and there would have been no waste, as the consumption is only proportioned to the air allowed to enter; but, in general, it may be convenient to have to look at and charge the fire in the middle of the day and at bed time."—p. 45.

"What chiefly surprises a stranger" (at least it so happened in our own case), in these remarks is their excessively loose and unpractical character. As the Doctor has taken such ample time to acquire his experience, and allowed himself nearly as much space as an octavo volume for their detail, if he had chosen to indulge his readers in that way, it was only natural to expect that the information as to the actual practical working of his stove would be both full and precise. In point of fact, it is not only exceedingly meagre, but vague and unsatisfactory beyond measure. The necessity for extinguishing the fire to remove the stove *might have been* prevented. Why was it not, in the course of the year and a half that have elapsed since the origin of the invention? The temperature *might have been* made as much higher or lower as the Doctor liked. Indeed, then, why was not the experiment tried? If all the other "might have beens" are like this, their value is easily determined. The assertion is of course pure nonsense: eager as the Doctor is to vaunt the wonders of his stove, we may suppose he does not mean seriously to assure us that by lighting a fire in it he could reduce the temperature to the freezing point at midsummer,—yet this is within its capability, according to the strict interpretation of the terms made use of!

The reader has to complain also that no clue is given to the dimensions of the library which was heated at the small charge of a penny a day, although that is a point of the very first importance in the forming of a right judgment on the matter. It might have been as well also, if the Doctor had given the data whereupon he determined the quantity of coal used, inasmuch as his general assertions, unbacked by specific facts, are not to be entirely depended on; not, of course, that the thing occurs wilfully, but that the natural enthusiasm of an inventor sometimes leads him a little "beyond the bounds" when on his favorite theme. Dr. A. is but too apt to talk of his imaginations as realities, to respect but very little "the thin parti-

tions that do their bounds divide." Thus, in our first extract, he says "the whole mass of air *is, in fact, seen* to revolve with great rapidity," yet, immediately after, we are told what might have been seen "*if* smoking fuel had been used, *to make the motion visible*;"—so that the "rapid movements" of the mass had been "*in fact, seen*" only in the mind's eye of Dr. Arnott! Very satisfactory "ocular demonstration" this of the correctness of his darling theory of perpetual circulation!

As the opening portion of the Doctor's work is occupied with a lengthy collection of "elementary illustrations," so the description of his stove is followed by an equally tedious enumeration of its good qualities, the only essential portion of the book taking up merely a few pages in the middle. His exposition of the merits of the wonderful article is in parts exceedingly amusing, though altogether too verbose, and too outrageously silly to be any thing but annoying. Careful as the Doctor is, too, he contrives to let out enough to shew that the demerits of his stove are at least as conspicuous as the opposite qualities,—while in this case all the evidence we can obtain may be taken as that of a witness (and a most unwilling one)—as against himself, the best of all possible testimony. We have already seen that the fire was sometimes obliged to be extinguished to free it from "stones that had been in the coal." Now, the Doctor assures us that one of the great drawbacks of the common stove is that, "when the neglect of servants lets the fire go out, *it has to be lighted again*"! Pray, how was the matter managed with his own stove? Did that re-light its own fire,—or how? Throughout his abjugations of the old open-fire stove, he is eloquent on the trouble caused by the necessity of trusting to servants. Yet, from the incidental directions he gives for the management of his own, it would appear much more objectionable on this score. Bituminous coal must not be used on any account, or it would produce an explosion of inflammable gas—(or, as the Doctor phrases it, a "semi-explosion";)—"too much wood" must not be used for lighting the fire, *for the same reason; yet this is the stove* whose superior *safety is warmly extolled*;—a safety which *is at an end, it should seem*, whenever a "neglectful servant" should wastefully use an extra halfpenny-worth of wood! The cautions against this "semi-explosion" are continually recurring—and so indeed they ought to be. Those against carelessly causing the stove to smoke, are scarcely less numerous, and tend to the conviction that the new stove has no advantage over its predecessor on that account, although we are gravely assured in one place that, should the smoke attempt to come out into the room, the valve will close, and the only consequence will be that *the fire will go out!* The smoke will find its way elsewhere, however, if the outer case be not perfectly air-tight; and the attainment of that object, as might he expected from the Doctor's lamentations on that head, is very difficult—yet, without it, the stove will not act.

But of all possible specimens of the Doctor's ingenuity in puffing, commend us to the paragraph in which he points out the merits of this article as a cooking stove. Boxed up as the fire is in a case, it would at first sight appear to be totally unfitted for all culinary purposes; but only listen to the oracle!

> "It is a good cooking-stove, and therefore especially the poor-man's stove * * * * Potatoes and other things may be roasted *in the ash-pit*; and, if the ash-pit be made large, with the fire-bars sloping, so as to present a considerable surface of naked fire looking downward and forward, *meat may be roasted there!*"

Beyond this it is impossible to go!—Only think of "a good cooking-stove" whose only accommodation for roasting is presented in the *ash-pit!* How delicious would a prime sirloin be roasted in this fashion;—who would think of objecting to *scrumsh* a cinder now and then, or make a hardship of the ashes with which it must needs be plentifully bestrewn, from the magazine of stove-coal directly overhead! Positively the Doctor ought to take out a patent for this suggestion alone,—and, without a doubt, the idea is perfectly *novel*. It is applicable indeed, to the old fashioned open fire-places, as well as the new; but with this difference, that in the thermometer-stove the meat must be deposited in the ash-pit, and left to its own devices until quite ready for the table, as the action of the stove requires that it be kept hermetically closed, and the opening of it

even to remove the ashes is apt to derange the functions of the whole apparatus!—"And when the beef is taken out may we be there to see" but not *to taste!*

Seriously, was there ever exhibited so complete a spectacle of mental blindness as that exhibited by our author in the instance just noticed? And his book is absolutely full of them,—they occur in flocks, We have only time and patience however, to notice one other. Be it known that Dr. Arnott is fond of insisting on the superior economy of his stove, if for no other reason, because it dispenses with the necessity of fire-irons. He is never tired of pointing out the advantages of this important peculiarity, and *how* he makes out his case, we will show by an extract from paragraph 130.

"The only fire-iron absolutely required for the stove, is the bent piece of strong iron wire fixed in a handle, and called the rake, or *poker*, used for cleaning the iron bars below."

So far well.

"It will be convenient, however, to have a small *shovel* (O!) made expressly for putting on the coal,"

What shovels, among other things, we believe, are usually made for; but a common shovel will not do, be it observed; it must be made on purpose; but this is not all; we must also have

"A pair of long pincers, or light *tongs* for lifting or arranging pieces of the burning coal!"

And this is the way that fire-irons are to be dispensed with. O! Dr. Arnott, what common open fire requires more than *poker, shovel, and tongs,*—and poker, shovel, and tongs, you tell us, are "convenient" for your economical invention. Nay, more, they must be of peculiar construction, and not only they, but another well-known domestic impliment, may be required.—Again, *Arnott loquitur:*—

"For a well managed stove, a bellows to blow the fire can never be wanted; *but* any common bellows may be fitted to the stove by putting around its nozzle a plug which fits one of the apertures into the ash pit."!!!

So much for one of the means by which economy is secured. Not only peculiar fire-irons, but a peculiar pair of bellows, must be made for the "self-regulating fire." Its self-regulation is quite as complete as any other of its peculiarities. The thermometer, whose rising or falling regulates the draught, settles that matter, but the Doctor recommends, nevertheless, that every stove be in addition fitted with a hand-regulator, to be worked as need may require by some person in the room! Query, as the fire is to be kept in all night, what is to be done in case the hand-regulator should want attending to, or the bellows want resorting to, after the family have retired to bed? Must somebody sit up to keep the self-regulating stove in order, and prevent the ever burning fire from going out?

It would be useless to pursue the subject further; suffice it to say that the book is all of a piece. The Doctor asserts that no accident could occur to the person from his stove, and immediately adds, "besides, a cage of wire-work might be made to surround it, as a guard to prevent children, or other persons, from touching it"—a precaution, which, if taken, would be equally efficacious with any stove. He is fond of dwelling on the superior economy of his invention, and of recommending it (as we have seen) to the poor (for cooking!) Yet, from the only data on the point occuring throughout the work, it may be gathered that the expense is at least upwards of *six pounds*, —a sum far indeed beyond the power of the poor man to spare for such an object, especially as such an apparatus must necessarily be continually out of order, and calling for the attendance of the smith. Add to all this, that, taking the Doctor's account of the principle of action of his stove to be correct, it cannot be expected to work at all, since no such thing as the "*red hot air*" of which he speaks as necessary to the circulation of hot air, on which his whole contrivance turns, is, or can be in existence,—and we think there is "enough said" as to his "thermometer stove."

Still then is another division of his work, that on "ventilation"; a most important one, since it is one of the advantages of the new stove that it would quickly destroy the health of the parties using it, unless some artificial system of ventilation were adopted, at whatever trouble or expense. Dr. Arnott is quite as much in his element here as on the subject of "warming:" in proof of which we need only adduce his remarks on the ventilation of railway tunnels, on which he is particularly great. W

are happy to find so great an authority demolishing so satisfactorily, and withal with so much ease, the objections that have been advanced to the so-called nuisances. What can be more conclusive than the way in which he shows that tunnels are even now well ventilated, or what more complete than the plan he proposes for ventilating them, if possible, still better?

Ventilation "take places, in all cases, at present. 1. By the wind blowing through them. 2. By the effect of the perpendicular openings in them, called shafts, through which the air in winter, because then hotter than the atmosphere, ascends; in summer, because colder, descends; producing, in both cases, a change of the mass below. 3. By the passage through the tunnel of the trains of carriages, driving the air along.

"In any case where these influences are insufficient, it would be easy, by hoisting a sail on one of the carriages of a train, which sail would nearly stretch a-cross or fill the tunnel, absolutely to sweep out the whole of the air at each transit."

This settles the affair; the opponents of tunnels are clean put out of court, and Dr. Arnott's reputation for *windy* doctrine established for all time. Our poetical friend, Simon Bore, however, the author of the "Trueisms or Incontrovertible Facts," from which we gave a quotation in the commencement of this article, hints to us that he cannot so well agree with the Doctor on some of the points here touched upon, as on that as to the vital necessity of "victuals and drink." Especially, he confesses himself enable to comprehend in what manner the air in the tunnel, in summer, is to *descend* UP the shaft,—as the Docter informs us it will. He can very well make out how it can *ascend* to the atmosphere through such a medium, but, inasmuch as the shaft in railway tunnels go upwards, and not downwards, he cannot conceive how this *descending* motion is to be effected;—friend Simon is also rather dubious as to the *ease* with which a tunnel might be cleared of its air by the Doctor's splended invention of a sail. On this head he brings forward a "trueism" as to the resistance of the air in such a case, which interferes most abominably with the plan. But "trifles light as air" should never be allowed to stand in the way of so brilliant an idea, and Dr. Arnott may surely be safely pitted against friend Simon; in his own person he is equal to fifty Bores!

Determined "twice to slay the slain" he returns to the subject of tunnels, and, in perhaps the most splendid specimen of what should be called the Arnott style of argument throughout the work, thus makes mince-meat of his adversaries:—

"These parties thought they saw six great dangers to health in the tunnels; namely,

"1. *The Temperature.*—Yet this in tunnels is always the medium temperature of the climate, equally removed from the two hurtful extremes of heat and cold, and differs little from the natural atmospheric temperature of a great majority of days in the year. And in the warmest summer noon, a person entering a tunnel for the usual minute or two of the passage, is less tried than a person in winter crossing a staircase from one warm room to another; and much less than one who follows the almost universal practice of going to bed in a room without a fire.

"2. *Impurity of Air from Smoke.*—Yet the thing objected to exists, of the same kind, and often more in degree, in a smoky room anywhere.

"3. *Moisture from the condensed Steam and Springs in the Earth.*—Although there is much less of it than in the air of a misty or rainy day.

"4. *Rapid Passage through the Air.*—Although the effect is the same as of the wind passing persons in a windy day; and much less than when, in the open air, the railway carriage moves against the wind.

"5. *Sudden Darkness.*—Although the change is less sudden than when a person puts his hands over his eyes, or goes into a dark cellar, or when the lights of a room are suddenly extinguished.

"6. Noise, although this is not so great as of many manufactories, or of military review firing.

"And be it remarked that a man who chooses to pull up the glasses of the carriage and carry the same air with him through the tunnel, absolutely avoids four of the alleged dangers; namely, the change in temperature, in purity of air, as to smoke and moisture, and the current; and by shutting his eyes and putting cotton in his ears, he may if he choose avoid the other two.

"The whole six objections fall perfectly under the head of *alarm from novelty*, to a person ignorant or inexperienced. And, as a child allowed to believe in ghosts may be terrified into fits by any noise in a church yard at night; so may grown-up children, so

ignorant or thoughless as not to be aware that the human constitution can bear with impunity much greater changes as to temperature, composition of the air from smoke and moisture, currents or winds, light and darkness, and noise, than he meets in a tunnel,—be terrified, and, as far as the terror can hurt, be hurt, by passing through a tunnel; the effect, on any ordinary person, is in reality the same as passing along any narrow street at night."

Now that we have quoted this extraordinary passage, we feel it necessary to add, most solemnly, that it is a *bona fide* extract from the Doctor's pamphlet, on the face of it, indeed, it would appear to be an emanation from the brain of the facetious Boz, in pure ridicule of a "scientific" defence of railway tunnels. No such thing. It stands, just as we have extracted it as part and parcel of Dr. Arnott's lucubrations, and, for aught that can be perceived, is intended for a piece of serious reasoning! He evidently thinks he has triumphantly disposed of all objections, when he has proved that passing through a tunnel always combines the delights of a room at once cold and smoky, a wet, dark, and windy day, and a noise equal to all the bang and clatter of a review!—"What next, Mr. Merriman?"—Why, the suggestions as to avoiding the disagreeables incident to the passage most appropriately follows. It is beyond the power of the most saturnine to suppress a *guffaw* at this paragraph; the idea of the unfortunate railway traveller, making himself quite comfortable by rendering himself deaf and blind for the nonce, completely caps the climax, unless, indeed, that honour should be claimed for the notion, so creditable to a learned writer on ventilation, that, by keeping out the atmosphere, a person might "carry the same air" with him through the tunnel. Of course this could not done for a single second, and the unfortunate individual who should effectually adopt the precaution, if the tunnel were of some length, would be taken out a corpse at the end of it!—As to the Doctor's concluding remarks, they are singularly in place where they are;—after such a display, it well becomes him to sneer at "alarm from *ignorance*:" and his observation that "the effect is the same as of passing along any narrow street at night" aptly winds up the series; to hold good at all it is necessary that every narrow street at night should be not only dark, but cold, smoky, windy, wet, and noisy, —a combination that happily does not occur quite so often as the Doctor would lead us to believe. But further remark is superfluous: Dr. Arnott is his own best commentator and "his own words do most condemn him."

Taken as a whole, the publication of this work on "Warming and Ventilating" will lower the reputation of its author not far short of a hundred per cent.

SOLUTION OF PROBLEM IN SURVEYING.

Sir,—I beg leave to send you the steps for the solution of A. B. White's, of Bath, question on surveying, proposed from Dalby's Course of Mathematics, (see vol. xxviii. page 217, *Mechanics' Magazine.*) I would have given a full trigonometrical solution of the question, but as the calculation is rather tedious, and supposing he Mr. White, is acquainted with the common rules of plain trigonometry, he will find no difficulty in making out the calculations from the following simple precepts :—

Let W C P S be a rectilinial figure similar in every respect to the required one; join W P, and instead of W H being supposed to be given, let us assume C S as a station line of any given length, say 1000 yards, then,

1st. In the triangle S C H we have all the angles and the side C S given to find C H.

2d. In the two triangles W C S, S C P we have all the angles given, and the side C S common to the two triangles W C S and S C P; ∴ W C and C P become known.

3d. In the triangle W C H, the two sides W C, C H are known, and the included angle W C H is given, from which W H is found.

4th. In the triangle W C P we have W C, C P and the included angle W C P given to determine W P: then lastly state as W H : W P in the assumed figure, so is W′ H′ : : W′ P′ in the required figure.

O. N.

February 17, 1838.

P. S.—I have read Nautilus's letter of this day, and I must say, a more disingenuous article I have never seen. I shall take an early opportunity in replying to it. I am rather surprised that Iver M'Iver has not complied with my request: or has the present frost so benumbed his fingers that he is incapable of writing? If such is the case, I will feel obliged to any of your able mathematical contributors to state their opinion on the subject which I referred to Iver M'Iver.

AVERY'S ROTARY ENGINE,—PERFORMANCES OF MR. RUTHVEN'S ENGINE AT EDINBURGH.

Sir,—In your 752d number, was inserted a communication from a friend respecting Avery's steam-engine, and Mr. Ruthven's works here, which is in some respects imperfect and incorrect, as is shown by " Hero's" inquiries in your next number. With your leave I will give you some account of the engine, which, so far as it goes will be found correct, as it is the result of personal *inspection.*

Mr. Ruthven's engine is made exactly *after Mr. Avery's American specification, which was* published in No. 637, of your Magazine. The arms are oblate, and five feet diameter from end to end; they are hollow, and made of steel plate. The hole in each arm is $\frac{1}{20}$th of an inch area; the two are consequently equal to $\frac{1}{10}$th; the arms revolve in a cast iron case. The velocity with which the arms travel is 3000 revolutions in a minute, which gives in round numbers, 45,000 feet per minute as the space through which the ends of the arms travel.

The boiler consists of three tubes 16 feet long, two of 12-inch diameter, and one of 24-inches; the large tube being above the two smaller ones which are placed side by side; a space being left between them. The boiler tubes are connected together by two tubes each, one at each end; the fire is placed under the two lower tubes, the flame from which returns over the top of them, and under the bottom of the upper one. The water fills the two lower tubes, and about two thirds of the upper one, leaving one third for steam. Your correspondent is correct in saying, that the speed is reduced by means of drums and belts; and Mr. Ruthven has carefully fixed friction rollers for his shafts to turn upon, which is of considerable importance.

Having seen the engine at work several times, I will now give you a correct account of what, up to this time, it has done; but I must premise, that having never seen the steam above 28lbs. pressure, and as 70lbs. is what Mr. Ruthven proposes to work it at, either the engine takes the steam away too rapidly, or the boiler and furnace do not do their duty. From the fire surface of the boiler, it cannot be considered less than equal to 12 horse-power, while in fact I have never seen the engine do one-horse work; nor can Mr. Ruthven put much more upon it. But to the proof.

The machinery attached to the engine consists of a light lathe, a small slide rest, a grindstone, a vertical drill, and a small planing machine. The slide rest when I saw it at work, was turning a piece of cast iron 12-inches diameter, with a very light cut, (not one man's work;) the vertical drill boring with a pin drill about an inch hole; the planing machine was often driven by a boy of fourteen, and was light work for him; the grindstone had two men grinding tools, say chisels or drills (a boy's work

again,) and that is all. I put it to any practical engineer if a horse-power would not have done more work? But Mr. R. says, that two men with a strong bar have pressed upon the grindstone and not visibly retarded the steam-engine; and so they might; but when I inform you, that the grindstone is not even 3 feet in diameter, and does not turn more than 60 times per minute, and is driven by a belt only 2½-inches wide, it requires no sneer to shew that the most resistance is very trifling.

With respect to the sourse of power of this engine, whether it is the resistance of pressure consequent upon the two openings, as Mr. Ruthven affirms, or whether it arisen from the reaction of the steam, against the air or steam in the case, as some think, will make but little difference in calculating the supposed power.

For argument sake we will suppose the power or reaction is as perfect as in the cylinder engine; that the two openings equal $\frac{1}{10}$th of an inch; the velocity 45,000 feet per minute, and the steam 28lbs.—then $.1 \frac{\times 45000 \times 28}{3300} = 2\frac{27}{33}$ horse power. Now, if this engine require a twelve horse boiler—does less then one horse work—and cannot on any showing do three horses work, where can the saving be? That Mr. Ruthven is satisfied himself, that all that he asserts is correct, I do not for one moment doubt; I have known him and esteemed him for years, and believe him totally incapable of saying any thing but what he thinks is true; he and his son say that they have seen the engine perform satisfactorily in America—but I say why not prove it here? This might be done for a few pounds; and one days work at full power, with a careful account of fuel expended, would be worth more than all the last twelve-months talk, or any thing I could say, if I filled a volume with its praises.

I am, Sir,
A SUBSCRIBER TO THE MECHANICS' MAGAZINE FROM THE FIRST.

Edinburgh, Feb. 15, 1838.

DR. SPURGIN'S ENDLESS LADDER.

Sir,—In the extract from the "Mining Journal," quoted in your 757th number, a description is given of an endless "Jacob's Ladder" (so termed by seamen) to be employed in raising miners, &c.

A machine for such purpose has been long a desideratum, and liberal premiums have been offered for its attainment, by the Polytechnic Society of Cornwall, to be adjudged by certain professional officers.

Now, a principal objection to most of the ingenious plans submitted, has been that of the liability of the chains, ropes, or other suspending materials giving way, and consequently precipitating the whole to the bottom of the shaft.

Dr. Spurgin's ladder, although very simple is not free from this important defect, and of course will never come into very extensive use for mining purposes, although, perhaps, applicable to others of less risk.

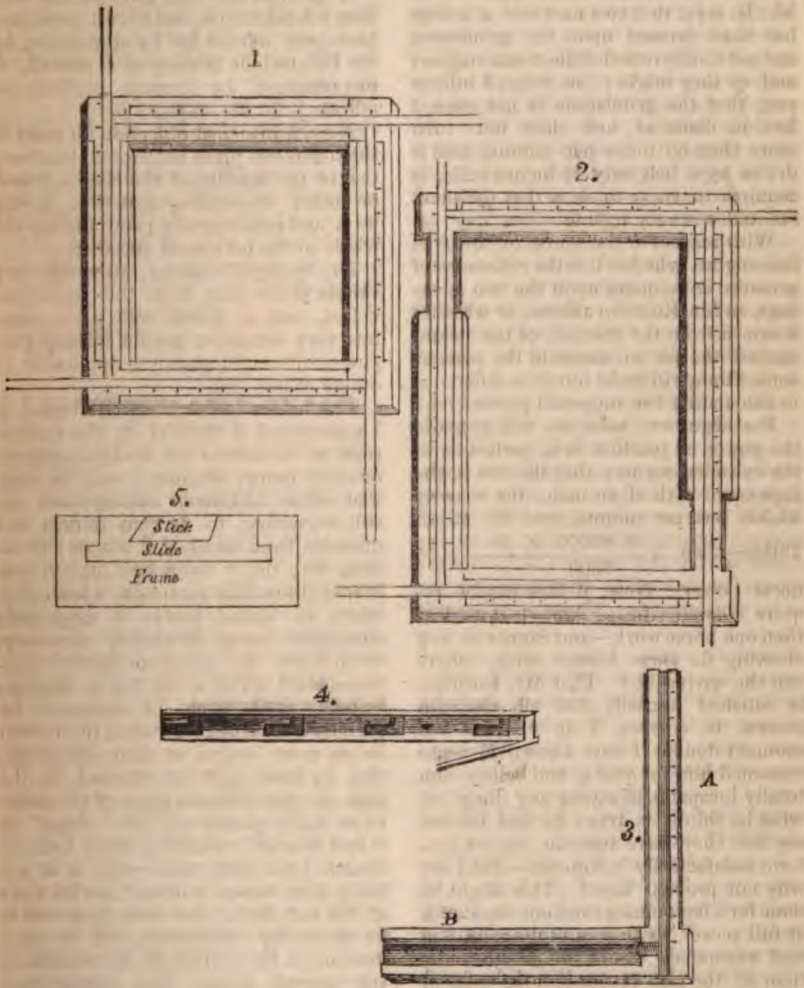
The ladder is familiarly illustrated (if I understand it rightly) by the endless train of buckets in the dredging engine, or chain pump, whence it will be seen that some additional contrivances are still necessary, to prevent miners and minerals from being *shot* out in succession, into the "barge" or other vessel prepared for their reception, when either steam or animal power is employed; stoppages being absolutely necessary, when either the people or matters conveyed shall arrive at the top or bottom; besides, as it would be necessary for each level to be accomodated, there must be as many stages as there are levels, that is, time must be afforded for the men in the different parts of the mine, to be safely placed on the "steps" or "foot boards" railed in, many fathoms distant from each other—for it is not likely that miners whose "fearful risks of life and limb," are here proposed to be materially diminished, will be seen arriving at the surface, in succession on the several staves, like shipwrecked seamen clinging to shrouds, which must necessarily be the case if the "uninterrupted circulation" be kept up as stated; each man in turn being liable to be precipitated in case of a false step or want of sufficient activity to avoid being turned completely over the wheel.

It would no doubt be interesting to many of your readers to know how these difficulties are proposed to be met.

I am, Sir,
Your most obedient servant,
NAUTICUS.

Feb. 19, 1838.

EXPANDING DRAWING-FRAME.



Sir,—I invented the drawing frame which is the subject of this communication many years since, and having had it more than ten years in use, I can speak decidedly as to its merits. It often happens that being about to make a drawing, even although you be possessed *of several frames*, you have not *one of the size required.* This having *often occurred to me*, I endeavoured, *and succeeded in* making an expanding drawing frame, which up to a given size is capable of being drawn out each way, so as to produce a frame of any dimensions, thereby superseding the necessity of having a variety of sized boards.

The method of holding the paper is by four long sticks, having in their outer edge some short brass pins driven in, and small notches cut into the side of the sliding frame to receive the pins. The paper being well wetted on both

sides is laid over the groove cut to receive the sticks. The sticks are pressed down on the paper until quite to the bottom of the groove; they are then forced a little way forward, lengthways; the pins enter the under cut of the notches and are then secure: it will be seen by the section, that this groove has its inner side of a dovetail form, the other sloping to allow its free entrance.

The paper requires to be just a trifle wider than the outside of the grooves, but not wide enough to allow any beyond, when in its place. When dry the paper is as tight as a drum. Its having no back to it, is quite the reverse of an inconvenience, as it enables the artist to damp the back with a sponge when about those parts he wishes to prevent drying too quickly.

The method of expanding the frame is as follows:—The sticks being made as long as required when the frame is expanded to its utmost, each way; the slides are originally made of the same length, but for convenience are cut off in inch lengths, until they allow the frame to be pushed up to 12 inches square, or any other dimensions chosen as its smallest size. These inch lengths are to be kept by you. Suppose it is desired to strain a piece of paper 15 inches by 13: pull out all the slides; put into two of them three of the inch pieces, and to the other two one of the inch pieces; the frame then put together, is as perfect as if made of that size, and will hold a paper exactly 15 by 13 inches; and so on for any other dimensions to 23 inches square.

It may appear at first sight that the sticks projecting beyond the frame is an inconvenience; but I have never found them so. Every person in drawing sits somewhat to the left of the picture; the bottom stick being on the right hand corner is quite out of the way, and of course all the rest.

Fig. 1 is a plan of the drawing frame shut up to its smallest dimensions, that is, to 12 inches square.

Fig. 2 is the frame when drawn out one way, and having 3 of the inch pieces put in; it is then 12 by 15 inches.

Fig. 3 is a part completely drawn out, *showing its construction.* The one side *A, made to slide* into its counterpart, the *other, B, to* receive the slide.

Fig. 4 is a portion of one of the slides, showing the form of the holes to receive the brass pins of the stick which confine the paper; being exactly one inch apart, or when the inch pieces and slides are put in, the pins on the sticks will not fit.

Fig. 5 is an enlarged section of the entire frame, showing the frame, the slide, and the stick.

Four pins, being equidistant, in each stick, will be found sufficient. It may be as well to observe, that those who sketch heavily with the pencil, had better make their sketch before straining the paper.

Your's, &c.
JAMES WILCOX.

IVER MC. IVER'S ASTRONOMICAL FORMULA.

Sir,—In answer to O N's request, No. 755, page 283, I beg leave to inform him that my reason for asking him "why the perpendicular P N (see his own diagram in No. 755) must fall upon D Z′ produced," was, that I had (before proposing the question) calculated both D Z′ and D Z, and found that D Z was greater than 90°, and consequently the first time the two stars were in the same vertical circle at Edinburgh, Procyon would then be below the horizon. Nautilus asserts the contrary, No. 731, page 213. In this Nautilus is certainly wrong, indeed any one, although perfectly unacquainted with spherical trigonometry may satisfy himself of the truth of the matter by means of a celestial globe. I am sorry to see both gentlemen (a better matched pair could hardly be found) so snapish in their replies to one another; each seems to fight for victory, although I would not be much surprised, if they were to meet, a bottle of good old "crusted port" would make them both good friends; they are certainly both valuable correspondents; Nautilus from experience in nautical astronomy, is perhaps better acquainted with the practical parts than O N is; O N on the other hand is perhaps more deeply read in the theoretical parts. This at least is my opinion of both gentlemen, and if they could contrive to agree a little better with one another much valuable information might be obtained from each of them.

I was much pleased with the ingenious solution of the horological question given by a lady (L. A. S.) in No. 756, I trust we shall often hear from her, and that no second ungallant "Ursa Major" will cross her path, as was the case with a highly gifted lady (M. S.) who gave one of the best solutions of a geometrical problem. that ever adorned the pages of the *Mechanics' Magazine.*

I remain, Sir, &c.

IVER MC. IVER.

February 24th, 1838.

THE GOVERNMENT SCHOOL OF DESIGN.

We inserted some time ago a notice of the opening of this School at Somerset House, under the superintendence of Mr. Papworth, the architect. Since then, the establishment has been so intensely-obscure, that it was generally supposed to be defunct, and some surprise has therefore been excited within these few days by the publication of an announcement to the effect that a series of premiums, of five and ten guineas each, are about to be adjudged to the pupils of the school, for the best designs applicable to manufacturing purposes, in the departments of ribbon and figure weaving, iron-casting, architectural ornament, china and glass ware, &c. &c. The first impression from the perusal of this announcement, is that the "new school" is in a highly flourishing state; but when it is perceived, on a closer inspection, that the premiums are not to be adjudged until *next July,* and that particular care is taken to make known that every pupil of *three months'* standing will be entitled to contend for the prizes, the suspicion cannot but be excited that the principal object in view must be to attract new scholars, by holding out an attractive bait within their reach. If so, the device is one hardly worthy the adoption of a national establishment, however creditable it might be considered to an advertising Yorkshire schoolmaster. We fear Mr. Papworth has been hitherto but little troubled with business, nor is it likely, notwithstanding the premiums may prove some little attraction, that the "School of Design" will answer any good end as far as the instruction of the working classes is concerned, while so large a sum as four shillings a week is demanded from each pupil. What has become, it may well be inquired of the Parliamentary grant of fifteen hundred pounds, for establishing the school? If it were pretty well attended, the sums received from the scholars ought to be sufficient for its support; and in that case is the whole to be applied to the payment of the five and ten guinea prizes, and the other methods of advertising the concern?

LONDON AND BIRMINGHAM RAILWAY.—NINTH GENERAL MEETING.

From the Directors' Report, read at the last general meeting of this company it appears that the railway was opened to Tring in the month of October last, but that a winter of unusual severity and duration, by retarding the remaining works, made the further opening to Denbigh Hall in January impracticable, and still occasions delay. A very few weeks, however, after the breaking up of the frost, will suffice to complete the road between Tring and Denbigh Hall, and between Birmingham and Rugby, and the earliest day will be appointed for the next partial opening. The engineer continues to express his conviction, that the entire completion of the railway may be expected in autumn of the year.

In anticipation of the next opening, the Directors have made arrangements for the booking and *conveyance of* passengers and *parcels for the whole distance* between *London and Birmingham.* Passengers will thus *have the benefit of* railway travelling for 77 *miles of* the distance between London and Birmingham, and of greatly reduced prices for the whole 112 miles, with a saving of one-third of the time.

From the time when the season for excursions had passed, and the curiosity of the public had been partially gratified, the railway travelling was limited to the purposes and accommodation of the immediate district; and the directors, having thus had the means of ascertaining practically the effect of the ordinary passenger traffic on that portion of the railway, are enabled to state with reference to the estimates which they have laid before the Proprietors, that the actual traffic has exceeded the amount upon which they had calculated.

Between the 20th of July last and the 14 th February, a period of thirty weeks, 162,216 passengers had been conveyed by the railway, without an accident to any individual passenger.

By the statement of accounts laid before the Proprietors, it appeared that

The receipts to the 31st December were............	£4,229,136 8s. 7d.
The disbursments................................	£3,981,828 12s. 3d.
That the balance of cash in the Company's hands at that date was................................	£247,307 16s. 4d.
And that the amount applicable to the further expenditure of the Company was........................	£625,456 1s. 7d.

The following is the substance of Mr. R. Stephenson's Report on the progress and present state of the works.

With reference to that portion between London and Tring, the permanent road is in tolerably good order, except on the Brent Embankment, near London, and on the Colne Embankment, near Watford. Both these works have continued to subside, with scarcely any intermission, more or less rapidly since their formation; the former from the slippery nature of the material which composes it, the latter from the unsoundness of its substratum in the valley of Colne. The gradual subsidence of embankments admits of no other remedy than maintaining the level of the railway by the constant supply of new sound material adapted for ballasting, which in the present case may fortunately be obtained from a convenient spot, and at a moderate expense, for there is in the Company's possession at the south end of the Watford Tunnel, a large store of excellent gravel and chalk, sufficient to meet all the demands of the line and stations between Watford and London for some years.

On the Boxmoor embankment, and some portions of the Aldbury contract, it was found very difficult at first to keep the rails in working order, but they are now in much better condition, and will continue to improve rapidly during the ensuing spring and summer.

The Tring Contract, which comprehended the most extensive excavation on the line, is now nearly completed. The whole of the excavations and embankments are ready for the further opening to Denbigh-hall, except that about 4,000 yards of permament road remain to be laid, not in one length, but made up of several smaller portions. There still remains work, which, as nearly as can be calculated, must require three weeks to perform. The embankments throughout this contract, consist almost entirely of chalk, which being already well consolidated, and little liable to subsidence, the immediate use of the permanent road may be reckoned upon as soon as completed.

The Leighton Buzzard Contract, is in a more forward state. The excavations and embankments are completed, and the permanent road laid with the exception of about a mile, made up of separate portions. Nothing remains to be done but laying the rails and blocks, which are also on the spot. The Sinslade Tunnel is completed, one line of permanent road laid through it, and the fronts so for advanced, that executing the remainder of the stone and brickwork will form no impediment whatever to the opening.

The Stoke Hamond Contract is completed, except a small portion left on the slopes of the cuttings, which cannot interfere with the permanent road. Of this there remains little more than a mile to lay in different places.

The Bletchley Contract which is completed, except 350 yards of permament road terminates at Denbigh-hall, where a station is now being formed for the temporary terminus of the London division of the line.

The Wolverton Contract which is from Denbigh-hall to Wolverton, will be completed in eight or nine weeks.

The Wolverton Viaduct is completed with the exception of the permanent road.

The excavations and embankments of the Castlethorpe Contract may be regarded as completed.

The Blisworth Contract, which consists of an extensive cutting is progressing favourably; but the character of the excavation is now more difficult than at first, and as it gets deeper, the space for employing men gradually becomes more confined. The material is increasing in hardness, and there has also been a greater quantity of water. In order to facilitate the completion of this part of the line, an arrangement has been made for throwing an additional quantity of earth into spoil from the centre of the excavation, and supplying the deficiency in the embankment by a corresponding quantity of side cutting at the southern extremity of the contract. The object thus aimed at is the completion of the south portion of the contract in May, nearly at the same time with the Wolverton and Castlethorpe contracts, at which period an extended opening may be made from Denbigh-hall to the village of Roade, situate on the turnpike road leading from Stony Stratford to Northampton, and only five miles from the latter town. This position appears highly advantageous for the next temporary terminus, which must remain the terminus for the London division until the opening of the whole railway.

Several minor contracts between Roade and the Kilsby Tunnel, are in a more or

less forward state, of which we have not room for particulars.

The works of the Kilsby Tunnel are at present in a very satisfactory state, and the monthly progress as regular as can be expected considering the nature of the operations. No new difficulty has recently occurred, except the capricious appearance and disappearance of water in some of the shafts both in and beyond the quicksand. Between these shafts the junction of the respective portions of the tunnel has consequently become rather uncertain, the actual rate of progress in tunnelling through the intermediate space falling short of what was estimated. To remove this source of contingency as much as practicable it has been found necessary to sink additional shafts for the purpose of dividing those unfinished portions which would require the longest time to execute, or in which the average rate of progress was most likely to be interrupted by water or a change in the nature of the strata. On the 20th of January last, a careful admeasurement was made to determine accurately the distance unfinished between each pair of shafts, and the time of completion for each, calculated upon an average which there are the no reasonable grounds for doubting. From which it appears that the whole tunnel will be completed by the end of next July. In the quicksand, especially, although effectually drained, the utmost caution in mining has been required, and an expenditure of timber unavoidably incurred, which would appear excessive and lavish to any one whose experience has been confined to ordinary tunnelling. Several circumstances have occurred demonstrating that none of the precautions or expenses have exceeded what the magnitude of the difficulties attending this work imperatively demanded.

The remaining works of the Rugby Contract will occupy four months, making the period for completing this contract extend to July; and to this add one month for the permanent road, making it the beginning or say the middle of August.

The Rugby Station is at present in rather a backward state, owing to the severe and continuous frost, which has almost entirely put a stop to the brickwork and permanent road. From this station to Birmingham, one line of permanent road is laid throughout, and the other, with the exception of a short distance (about one hundred and fifty yards) in the Church Lawford cutting. Though laid, however, the road is not in a fit state throughout to be travelled upon by engines and trains; for on some of the principal embankments it requires to be raised and adjusted. But this is a work which with the proper number of men can easily be completed before other points already specially alluded to, as regulating the approaching opening.

At the Birmingham Station the large turnplate in the locomotive engine-house is completed, and the necessary rails fitting it for the reception of engines will be laid in a few days. The lines of rails in the passenger sheds are laid, and the requisite sidings will be completed in a fortnight.

From the foregoing remarks on the respective contracts throughout the line, it will be perceived that the works now remaining to be executed are not only confined to a few points, but also limited in magnitude. Blisworth alone appears to involve difficulties which may possibly interfere with our calculations and prospects. From Denbigh-hall to Blisworth the works are now rapidly approaching to a close. The great feature of that portion of the line,—the embankment over Wolverton Valley—will be joined to the viaduct in about a month; and the line virtually finished and prepared for passengers as far as Roade in the course of May next. The unfinished portion of the line will then be confied to the distance of miles between Blisworth and Rugby; but the greater portion of this length is at present nearly complete, and the only works of any magnitude remaining are—

I. The Blisworth excavation now containing not more than 100,000 cubic yards of materials to be removed.

II. The Long Buckly contract, with two excavations, both of which may easily be executed in less than four months.

III. The Kilsby Tunnel, with 400 yards of tunnelling to do, divided into portions limited in extent: and

IV. The Rugby contract, now in a very forward state; the unfinished works being confined to two excavations, favourably situated and circumstanced for suitable measures being adoped to secure their expeditious completion.

Of these four points there are two—the Long Buckby and Rugby contracts—which involve no difficulty whatever, the works being quite of an ordinary character; of the remaining two, Kilsby and Blisworth, it is only the latter which need be regarded with particular anxiety, and this work it does not appear impracticable to complete in time, should the approaching season prove favourable. Unless there should be impediments to the undersetting of the rock with masonry exceeding what is at present anticipated, an opening through it will be made in six months from the 1st of March next, which would make its completion almost simultaneous with that of Kilsby Tunnel.

NOTES AND NOTICES.

Dr. Arnott exculpated.—Sir,—There is a paragraph inserted in your "Notes and Notices" at page 384, charging Dr. Arnott with "exaggeration," arising out of his enthusiasm as an inventor. I feel myself in some measure called upon to vindicate the worthy Doctor from this gratuitous attack, which is uncalled for. Should the talented author of "Elements of Physics" condescend to notice this *critique*, he would, no doubt greatly to the writer's surprise, give as his authority, the very individual against whom he has been so unwarrantably pitted. "In dilating on the dangers resulting from the use of open fire-places," Dr. Arnott is perfectly justified in taking into his account, the number of *chimnies on fire*, which in Mr. Baddeley's Report of London Fires for 1834, was stated to vary from one hundred to one hundred and fifty per month. (Vide *Mec. Mag.* vol. xxii., page 351.) Taking the lowest number, and adding the average number of houses on fire (which is very fairly taken at forty), Dr Arnott is quite within compass, indeed he is rather *under* than over the mark. I remain, Sir, &c.

London, March 6, 1838. W. BADDELEY.

Sir,—In your last Number there is a sneer at the "exaggeration in which enthusiastic inventors are too prone to indulge." In stating the average number of accidents which happen in consequence of the use of open fires, Dr. Arnott of course includes those which happen to individuals, clothing, furniture, &c., and I should like to be informed how the number of these is to be ascertained, or even *guessed* at from "the total number of fires *attended by the fire Brigade*."—Yours, &c.

March 5, 1838. C. G. J.

Mr. Baddeley's Bookbinders' Alphabet Scale.—A correspondent, "A. Birch," informs us that the scale for cutting alphabets of various sizes for ledgers, communicated by Mr. Baddeley, and inserted in our last Number, has been in use among bookbinders for the last thirty years.

Progress of the Arts through Patronage.—One of the most important discoveries in the *Useful Arts* recently rewarded by a medal of honour from the "Society of Arts," was actually neither more nor less than an improved method of *tuning kettle-drums*, whereby the tone is preserved much better than by the ancient mode, while at the same time the compass of the instrument is extended! It is surely a heavy reproach upon the age than an institution which thus patronises the arts of utility should be itself in danger of expiring for lack of patronage, and should the unwelcome consummation actually take place, the dirge of the venerable society ought by all means to be accompanied by a dozen or two of kettle-drums, tuned on the new and improved principle: the effect would certainly be most impressive!

New Hull Steam Ships.—Those exemplifications of the *ne plus ultra* of cheapness, the Hull steamers, begin to exhibit symptoms of a rise in prices, one of the companies having raised the fare, for the forecabin, to *six shillings*,—a most unconscionable charge for a voyage of only two hundred miles! On the other hand, the most determined cheap company of last season have built two new vessels, the "Victoria" and the "Wilberforce," expressly for the station, and fitted them up both as respects machinery and decoration, in a style surpassing that of any steamers now on the river. It does not yet appear, however, that these new-comers are intended to run at the extremely low fares of last season, —amounting for the forecabin to *two shillings* only! If they do, it may be truly said that "the march of cheapness can no farther go!"

Parliamentary Business.—The number of bills for public improvements has considerably diminished in the present session of parliament, as compared with the last. This is accounted for from the fact that the railway companies, on all the principal lines, have already obtained their acts of authorization; several, however, have applied for amended acts, and more extensive powers. Mr. Alderman Wood's Bill for improving the city is still "dragging its slow length along," in the House of Commons, from which it is not likely to emerge this session, as the House has an awkward habit of being "counted out" when either this bill, or that introduced by the same worthy member for the "regulation of hackney carriages," happens to come under discussion.

Reciprocal Liberality.—By a recent arranagement, all English architects travelling for improvement in Saxony and the territory of the Hanse Towns are to be admitted freely to view all the public buildings, &c. without expense,—on the condition which has been acceded to by our own Government, that the architects of those countries shall enjoy a similar privilege here. Negotiations are in progress for the extension of this give-and-take system to other parts of the continent.

Two criminals in the prison of Breste have just invented an apparatus intended to prevent the explosion of the boilers of steam-engines. M. Arago has earnestly solicited the patronage of the Academy of Sciences for these unhappy men, who exhibited much resignation and patience under their punishment.—*Morning Herald.*

Joyce's Stove and Fuel.—This invention was on Thursday last specially exhibeted at the Jerusalem Coffee-house to a scientific company assembled for the occasion. The heat is not produced, according to the inventor's statement, from radiation, but from a draught or current of air playing between the two cylinders, admitted through apertures at the base of the stove. One of the stoves, with a nine-inch exterior and seven-inch interior cylinder, gives out a heat at a temperature of 60 deg. for 24 hours. The degree of heat may be regulated at pleasure by the regulator, by which, if shut down, the same quantity of fuel would be made to last for 48 hours. From the fuel, which is prepared charcoal, no sulphurous vapour arises, and therefore it cannot be detrimental to health.—*Times.*

The Patterns and Inventions Bill was again appointed to have been read a second time on Wednesday last, but in consequence of the debate upon the conduct of Lord Glenelg as Colonial Secretary being adjourned to that day, from Tuesday, it was again put off.

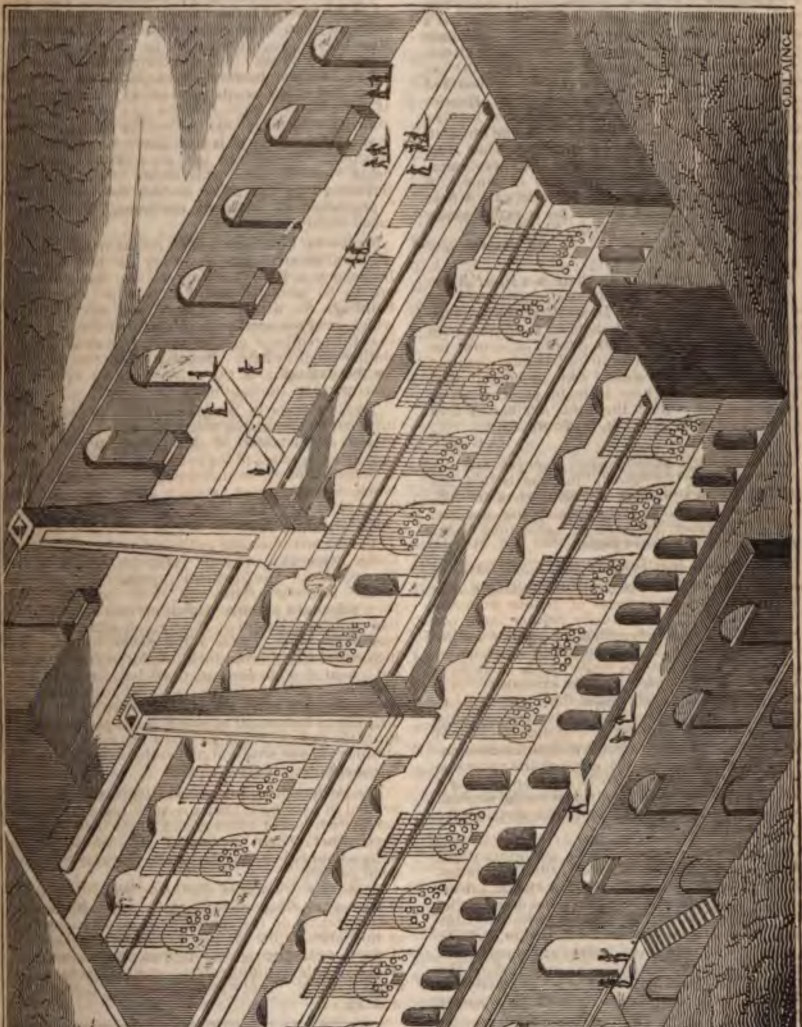
Mechanics' Magazine, Complete sets.—The proprietor of the Mechanics' Magazine has now effected the repurchase of the earlier portions of the stock of this journal from the parties who were possessed of the same in the right of his first publishers; and he is now able to supply several complete sets of the work. Price, twenty-seven volumes, half-cloth, £11 7s.

LONDON: Printed and Published for the Proprietor, by W. A. Robertson, at the Mechanics Magazine Office, No. 6, Peterborough-court between 135 and 136, Fleet-street.—Sold by A. & W. Galignani, *Rue Vivienne, Paris.*

Mechanics' Magazine,

MUSEUM, REGISTER, JOURNAL, AND GAZETTE.

No. 762.] SATURDAY, MARCH 17, 1838. [Price 3*d*.



THE LONDON GAS-WORKS, VAUXHALL.

THE LONDON GAS WORKS, VAUXHALL.

Sir.—These works are situated on the Surrey side of the Thames, and within a few yards of Vauxhall Gardens. They occupy a considerable space of ground extending from near Vauxhall Bridge in the direction of Lambeth Palace. The two ranges of " double lifting gasometers," with their triple tiers of cast iron columns are objects of considerable attraction. The gigantic proportions of these enormous reservoirs, measuring 60 feet in diameter: and 50 feet deep, have a singular effect when viewed from the opposite bank of the river in front of the Penitentiary. This establishment has obtained great celebrity on account of its vast magnitude, (being now the most extensive in Europe,) and also in consequence of the new principles which are here employed in manufacturing coal gas.

The works were constructed from plans and designs furnished by Mr. Stephen Hutchison, the resident engineer, and the remarkable success which has attended the operations of the company reflect credit upon the talents of that gentleman. There is scarcely a part of the metropolis and its suburbs that is not lighted by the company, and they are still farther extending their mains.

At the period when this company commenced operations, a species of monopoly existed in this trade, and complaints of the expense of gas lighting were numerous, as the consumers were then compelled to pay from 30 to 40 per cent. more than they are now charged; each of the public lights alone, which amount to upwards of ten thousand, cost the various parishes throughout the metropolis from 5*l* to 7*l.*: but this company upon commencing operations reduced the price to 4*l.*; private lights were also reduced in the same proportion. This reduction in the cost attending the supply of light was produced solely by the introduction of a more economical *system* of manufacturing and storing coal and oil gas, than had hitherto been in operation.

A complete remodelling and great *simplification* of the usual gas apparatus has been introduced by the new company;—the principal part of their machinery is constructed upon totally new principles. This is particularly the case in the plan of setting retorts, as it has been hitherto the system to heat only three or five retorts by *one* furnace, while at the London works *eleven retorts* of 20-inches diameter are ranged over a single furnace, and this method of building may even be extended to *thirteen* retorts. Another point was, the introduction of a more capacious gas-holder, at smaller cost than that which attends the building of the common or single gasometer. A peculiar manner of laying mains has likewise contributed greatly to the success of this company. The gas is sent to a distance of nearly eight miles from their works by the aid of small auxiliary pipes placed at certain intervals. This is done in order to reduce the friction caused by an immense body of gas being urged with great force through the leading mains. The same plan is being adopted by the water companies.

The London works are constantly visited by scientific men and other parties interested in the prosperity of the gas trade.

X. Y. Z.

VENTILATING THE HOUSES OF PARLIAMENT.

Sir,—As the subject of ventilating habitations more particularly with reference the House of Commons, where numbers of people are assembled for the major part of the twenty-four hours during a large portion of the year, has of late occupied much of the public attention, I trust the following observations on the general principles which regulate ventilation may not be deemed unworthy of a place in your widely circulated Magazine.

I must inform you at the outset, that *my* plan for ventilating the House of Commons is by no means new, and is as perfectly simple as are all the operations of nature. We are all full well aware, that the ventilation of our planet is regulated by the law, that whenever elastic fluids are heated, they rise, and that colder fluids flow in to supply their place. The general principles which regulate ventilation have been well known and understood since the days of Archimedes. Now, the mechanical principle which guides and governs all fluids whether aëreal or otherwise, is that they

their level by their own specific ty; this principle to make it avail- requires little expense, and to it into operation needs no machi- The philosophy of ventilation us at one jump to the practical of ventilating any habitation, large mall; the volume of atmosphere h we inhale, whether in a house, ch, factory-room, barrack, or hos- becomes vitiated by inspiration, expelled from the lungs, and g come in contact with the interior body is raised in temperature, and rendered specifically lighter than ternal atmosphere; this vitiated air fore, ascends, and its place is sup- by air of a purer quality: thus ery moment we are freed from eous poison which would other- cause our destruction. Here we ive by what very simple means e performs all her functions; in ll the phenomena of the universe uided and governed by a *very* eneral principles, and the single anical principle of all fluids find- eir own level, is at the bottom of e contrivances for warming, venti- , and purifying our habitations; ng constantly in mind that cool air cifically heavier than heated air, er it be heated by caloric, emanat- om heated flues, fires, or by breath- which is a species of combustion. this grand principle being con- y kept in view will at once point method of ventilating any habi- ; so that if we were required to ate, say the House of Commons, there are occasionally assembled r 600 people, nothing more is re- l to be done than to cut holes of dimensions in the skirting board gh the wall, and at certain distances each other all round the room on a level with the floor, so that les in the wall would admit a fair s of atmospheric air, which would l a very short distance up the wall escend by its specific gravity on oor of the House of Commons, would become heated by the fires es, or by caloric emanating from dies of the assembled multitude, ereby rendered *specifically lighter;* uld then begin to ascend, and be permitted to escape through her in the roof or in the wall, thus establishing a constant *flux* and *efflux* of pure and impure air. The holes in the walls might be so fitted as to regulate the temperature of the House of Commons, and also, so fitted as to prevent sudden draughts of cold air coming in contact with the lower extremities of the body.

So much for the philosophical and mechanical bearing of the subject of ventilation. I may as well remark before I conclude, that the principle I advocate here is well illustrated and carried out in the North London Hospital; if we go into any of the metropolitan hospitals, with the exception of the North London, our olfactories are assailed with a most sickly effluvia caused by the want of an efficient mode of ventilation. Thousands of pounds I understand have been expended in attempts to ventilate our metropolitan hospitals; but in these close-borough establishments everything connected with them is a *job*, and the improvement of science, and the comfort of its inmates a secondary consideration.

Hoping Mr. Editor, you will be pleased to give this insertion *pro bono publico.*

I am, Sir,

Your obedient servant,

C. Q.

London, March, 4 1838.

EXPLOSIONS IN COAL PITS.

SIR,—I take the liberty of troubling you, and with the most earnest feelings entreat that you will give a place in an early number of your scientific work to the few following remarks on this important subject.

It seems to be generally believed that when an explosion happens in a coal pit, that it solely arises from the escape of fire damp, or gas. I am not now disposed to question that prevailing opinion. As respects, however, the generating of gas, it is highly probable, nay, naturally to be expected, that the action of the miners' picks must cause innumerable minute particles of coal to float in the atmosphere of every part of the working chamber, which in the first place displaces a proportionate quantity of air, and obstructs ventilation; and, secondly, this *combustible* dust, becomes so dense, by accumulation, and the breathing of the

work-men, that it only wants consideration to convince us that gas is thus produced, and is most uncongenial to the men, and I consider capable of ignition by the miners' lights.

The occasional escape of fire-damp, and its liability to explode, conjointly with this imflammable dust, produces more severe effects when such explosion takes place, than would otherwise occur.

The means to effect relief, which I would propose, are, the precipitating the *combustible dust*, by forcing the working chamber full of *steam*, which would condense, and fall, and carry the particles of dust with it. The process would be simple and convenient, for steam could be easily procured from an apparatus fixed near the spot, or occasionally from the engine boiler.

I am persuaded that this plan would greatly *diminish* if not altogether *prevent* explosions; at any rate it certainly would facilitate the continual renewal of the air in the chamber, on which the vigour of the workmen so much depends. The operation I calculate, would occupy but little time; and as to the necessary length of the intervals at which to repeat it, experience would determine; a change of working apartments would occasion less loss of time, and admit the more complete renewal of the air.

I am, Sir, &c.
Your obedient servant,
A Correspondent.

Chester, Dec. 14, 1837.

IMPROVEMENT IN FIRE GRATES.

Sir,—I hope you will allow me through the medium of your excellent publication to suggest an improvement in the construction of register stove and other grates, which will prevent the dust from the fire place flying about the room in all directions when the servant removes the cinders, &c. in the morning, previous to lighting the fire, and also save much trouble in clearing the grate of ashes and cinders. At present the contents of the fire place are routed out with a poker on to the hearth stone, and then with a shovel taken up and placed in a coal box, each operation insuring a full distribution of the finer particles of dust throughout the room, which will settle *on the furniture*, pictures, &c., and on *the carpet;* from the latter by the action of the air, &c., these minute portions of dust are constantly floating in the atmosphere, and from thence taken into the lungs, and are very injurious to health. The plan I propose is very simple, and will not cause additional expense of any consequence in the construction of the grate, beyond the cost of the recipient for the ashes. In every grate is a bottom made of bars for the purpose of holding the fuel, and admitting air to insure combustion; I propose this bottom part be made to draw out by an ornamental knob, a small scraper being affixed, to clear off the ashes, as a stop for the bar bottom, to prevent its coming entirely out, and also to steady it; and this scraper can be so fixed, that when the fire is burning it will not be perceived; a sheet-iron or tin recipient for the ashes must be constructed to fit the vacant space under the grate, and easily placed so as to catch the ashes, furnished with a cover and handles. Instead of the present method, the servant will then have only to place the recipient properly, draw out the bottom, when the cinders and ashes will fall into the recipient, the dust ascending up the chimney; the ashes sticking to the side of the grate may be brushed into the recipient, the whole effected in a minute, and very little or no dust scattered in the room; of course when all the ashes are swept into the recipient, the cover is to be immediately placed on.

I hope I have sufficiently explained my plan, so as to be understood by every grate manufacturer, and that a trial will be made, with any improvements practical workmen are so competent to effect.

I am, Sir,
Your obedient servant,
E. G. W.

Hereford, Feb. 26, 1838.

THE "BRITISH ARCHITECTS" TRANSACTIONS.

The Institute of British Architects professes to be an offset from the Royal Academy, rendered necessary by the comparative neglect with which all matters not immediately connected with painting and sculpture are treated by the parent Association. It is not very easy, however, to perceive the points of resemblance between the two institutions: the

Royal Academy depends for its support chiefly on the attraction of its annual exhibition; the British Architects have no annual exhibition at all, and deriving their funds from the pockets of the members: the Academy gives a regular course of instruction to students, having a numerous staff of professors for the purpose; the "Institute" does nothing of the kind, and no Professors whatever are attached to it; the Academy is composed entirely of professional members, selected, whether partially or otherwise, at least ostensibly, for their professional merits; the "Institute" comprises a motley throng of architects and 'gentlemen at large', being apparently 'open to all comers' provided they produce the necessary golden key, and, of the professional part by far the greater number belong to the two great classes of the 'small known' and the 'intensely obscure': the Academy will not suffer any of its members to be connected at the same time with any other society,—as demonstrated very recently in the case of Mr. Cockerell, who was not even suffered to be on the council of the *offset institution* itself: the British Architects are but too to happy catch all the fish that come to their net:—finally, the world is never favoured with the "Transactions" of the Royal Academy, while the British Architects have just sent forth a goodly quarto* by way of commencing a never-ending series of theirs.—Of this goodly quarto it is the purpose of the present article to render some account.

The "communications," which form the staple of volume are divided into three classes, neither of which, strangely enough, considering the presumed origin of the Institute, is that of "design." Construction comes first, both in extent and importance, and here the first article is a "Prize Essay on Concrete" by George Godwin, jun., of which more anon. It is followed by one or two documents relating to the same subject, which are succeeded in their turn by two contributions of some interest from one of the "honorary secretaries," Charles Fowler, Esq.:—the first a description of the Metal Roof over the Fish Department of Hungerford Market; and the second, an Essay on Terrace Roofs, illustrated particularly from the well-known terrace-roof of the hotel at the same place. The next paper is of a miscellaneous character, relating, among other matters, to sewers and suspension bridges, foundation walls and foul flues,—the whole highly creditable to the skill and sagacity of the writers, Messrs. Smith, of Darwick,—near neighbours of Sir Walter Scott, to some of whose *works* (in stone and lime) at Abbotsford, they refer as specimens of their execution. Mr. Brunel comes next with the particulars of the experiments made by him on the novel mode of "binding brick constructions" by means of "wood, reed, hemp, and even straw, as being preferable to bars of iron or timber of large scantling."—These experiments were in "continuation" of those already familiar to the practical world, made by Mr. B. in the construction of arches without centering, at the Thames Tunnel works,—and the results on the present occasion appear to have been scarcely less surprising than on the former. The numerous recent experimental inquiries of the same nature, particularly those on the strength of cement, bid fair to lead to a new era in the arts of construction.

The only remaining paper in this division is one on the temporary pavilion erected at Edinburgh expressly for giving a dinner to Earl Grey,—a subject of exceedingly evanescent interest, and which the reader is not surprised to find is dwelt upon only by the architect *in propria persona.*

The second division, "Antiquities" is occupied, with two inconsiderable exceptions, entirely with a translation from the German of a lengthy disputation on "the Polychromy of Greek Architecture." It may well be doubted whether this article is worthy of the large space it takes up, although Meinherr Kugler, the author, may support with some degree of perverse ingenuity the strange idea recently promulgated by certain continental architects in search of something new at all hazards,—that the public buildings of the ancients received all the "advantages" of colour; in other words, that the Greeks (heretofore supposed to be severely simple in their taste) were accustomed to decorate the outside of their

* Transactions of the Institute of British Architects of London: Incorporated in the seventh year of William IV. Sessions 1835-6. Vol. 1. Part 1. "*Usui Civium, Decori Urbium.*" London, 1837, *Weale, 4to. p p. 171.*

edifices with as many different and gaudy colours as were ever displayed by the highly-admired front of Richardson's booth at Bartholomew Fair. This grotesque notion has hitherto been but little known in England, and it is very questionable whether it were worth the while of the Institute of British Architects to devote no small portion of their very first publication to the retailing of Kugler's arguments in an English form;—though, certainly, some little amusement, if not instruction, may be derived from the perusal of the Essays, and no one can regret that it has been the means of introducing so splendid a specimen of architectural and mechanical skill as the "illustrative plate." It is beautifully executed, in a variety of colours of the greatest brilliancy, and reflects high credit on Messrs. Day and Haghe, by whose new process of "Lithochromatography" it has been produced.

The third head is "Literature," the most meagre of all. The first article, "On the benefits resulting to the Manufactures of a country, from a well directed cultivation of Architecture," by Mr. Papworth, is of the most commonplace possible character, and includes not a single remark worth preserving. Mr. Donaldson's "Particulars relating to MSS. of Vitruvius in various European Libraries" are of a somewhat different complexion,—but the short paper on Irish Lunatic Asylums, which follows, is if possible of less mark or likelihood than Mr. Papworth's. The sheet of autographs of the Foreign Members of the Institute is of some interest; among the rest, we have those of Leo Von Klenze of Munich, and Schinkel of Berlin, whose productions have thrown into extacies divers enthusiastic admirers of everything continental, who would scarcely deign to look at the designs of of the *many* native architects who are at least the equals of the Prussian and Bavarian Palladios;

Having thus rapidly run though the principal contents of the volume let us return again for a space to the "leading article" of the whole, Mr. Godwin's Prize Essay on Concrete. This essay on the whole does great credit to its author, although it could have been wished that he had paid more attention to certain rules of composition which he has very laxly observed. He commences by tracing the use of concrete to the earliest ages, but not, we think, with peculiar felicity. The essential quality of "concrete" seems to be, that the materials used shall be of small dimensions, partaking rather of the nature of cement, than of cement and an already hardened matter, together—stone or brick for example. It is true, as Mr. G. remarks, that the small stones introduced *may* be looked upon in the light of the matter to be cemented, and the lime and sand as the cement; but the very term "concrete" itself suggests that the whole of the materials are looked upon as one mass by whose *concretion* the desired effect is to take place, and not as a combination of an already concreted mass with another not yet in the same condition. We think, therefore, Mr. G. is not correct in adducing "the Great Wall of China" for instance, as a proof of the early knowledge of the compound, and we are quite sure the Roman walls of Richborough Castle will not fairly answer his purpose. If they be admitted, then is every wall composed of concrete, which is built of stone and mortar, since the stones there used are of a size quite sufficient to be *individualized;* while, in true concrete, each separate stone should no more admit of individual consideration than each separate grain of sand. Our author is much more happy when he comes to treat of the modern history of the substance. He appears to have traced its origin (in recent times at least) with complete success; after noticing some Italian works which mention it, he observes:—

"Mr. George Semple, engineer, of Dublin, who published in 1776 a "Treatise on Building in Water" appears to be nearly the earliest modern English writer that treated of the construction of artificial foundations by concretion. He was at that time engaged in building Essex Bridge, Dublin, or rather in rebuilding it to an other design, a bridge so called having been there many years; and when digging up the old foundations under the inner part of one of the frames on which the piers were builded, he found that the gravel, which in every other place had been soft and yielding, was so hard that no instrument would touch it, and he was compelled in order to clear it away, to undermine and break it piece by piece with the hardest sledge-hammer that could be obtained. The middle of it, to use his own words, was an actual petrifaction.

"This effect, he saw clearly, resulted from the *small quantities of lime the gravel had absorbed*, or which had been washed into it from the superincumberent masonry during a series of years; and the consideration of this fact, he says,—of the *reimpiesta* of Palladio, and without doubt of that portion of Vitruvius relative to buildings in water before quoted, but which he does not, I think, mention,—ultimately led him, after various experiments, to propound the construction of foundations by concretion.

"Speedily to make a cheap foundation for a statue in a basin, for example, he directs that a wooden coffer, strongly bolted, is to be placed in the proposed situation under the water, and filled with very small stones, clean and sharp sandy gravel, and Roach lime.

"To form a foundation for the piers of bridges, he proposes to use a coffer filled with similar *stuffing*—as he terms it, in imitation of Alberti—and says, were he called upon to construct a turnpike road across a bog, he would build two rough stone walls to form the coffer, and fill in between them with a mass of flints or stones, clean sharp sandy gravel and lime.

"Of these different methods of making use of the lime in such work he writes at some length, and describes various experiments to determine the proper proportions of the several ingredients."—page 12

These experiments it is not necessary to go into: suffice it to say, that they prove Mr. Semple to have been well acquainted with the composition whose use he recommended. His book, however, seems to have attracted no attention, and it was not till long after, that the mixture it referred to began to attain its present popularity:

"When the generic term *concrete* was first applied as a special appellation to the particular composition under consideration can hardly be pointed out, the transition was so easy; but as this must have resulted from the general and frequent use of this concretion, the term perhaps, can only date from that period when its use became general and frequent, probably not longer than 15 or 20 years ago. It is true that in 1800 it was used by Mr. Ralph Walker at the East India Docks, but at that time it was so little understood that Mr. Rennie the elder, who was also engaged there, laughed at the idea, and when he found that Mr. Walker was in earnest, declared that he would have nothing to do with the execution of it. Mr. Walker, however persevered, and, notwithstanding the natural soil was exceedingly unequal and bad, in no one case did it disappoint his expectations.

"From that time to the year 1815, we find but a few isolated instances of its adoption; in this year however if I am rightly informed, it was used with succcess at the Penitentiary, Millbank. The soil was unstable in the greatest degree, and two towers erected with some attention to this fact, entirely failed; they were taken down, having split in several directions, a body of concrete was introduced, upon which they were built, and they stand well to this time.

"From that period to the present it has been more and more generally used; the very costly, and—as has been too often fatally experienced—very fallible process of filling for foundations, has been nearly abandoned, and few, if any, buildings of size or importance are now erected without the introduction of a concrete substratum."—page 12

Having disposed of the historical portion of his subject, Mr. Godwin proceeds to the descriptive:

"The concrete now generally employed is composed of Thames ballast and Dorking lime, in certain proportions; varying, according to the opinion of the user, and the goodness of the materials, from 1 of lime and 4 of ballast to 1 of lime and 12 of ballast. They are sometimes mixed together, slaked as mortar, and thrown into the foundation from a certain height; sometimes the ballast is laid on the site of the intended erection, and the lime poured over it in the shape of grout; while at other times the spaces to be concreted are filled with water, and the lime and ballast, having been first mixed in the proper proportions, are thrown in dry. Instead of gravel, Kentish rubble and broken pieces of granite, properly grouted, have been extensively employed, more particularly by Sir John Soane, who has used a preparation of this sort for most of the public buildings in Westminster executed under his direction; viz. at the Law Courts, the additional buildings to the House of Lords, the Library of the House of Commons, the Board of Trade and Privy Council offices, the State Paper office, and others. The foundations of these edifices were formed of granite, or other hard stones broken in small pieces (none exceeding the size of an ordinary hens egg) and laid in layers closely rammed and grouted, every third layer with a grout composed of Dorking lime and sharp river sand; other beds of similar pieces of stone were then laid, and rammed and grouted as before, and so the operation was repeated until the required thickness was attained. Upon the top of the mass thus formed, there is usually a tier of York landings, connected by a chain-bar from which arise the walls; and in some instances, as at the State Paper

Office, the brickwork having been carried up to a certain height, a second tier of landings was introduced."

Mr. G.'s remarks on the proper proportions of the ingredients are well worth consideration. It will be perceived that he considers a mass of concrete merely as a stone wall; and it is probably correct to do so in the sense and for the purposes here stated. But it would be quite a different matter to adduce *any* stone wall of remote date in proof of the antiquity of concrete. There is quite appreciable distinction enough between the two, as Mr. G. is well aware, of course, although in the early or historical part of his paper he almost loses sight of it, in the ardour of his pursuit of facts supposed to bear upon the question.

"I return to the former mention made of the concrete most generally used, which offers two points for consideration; first, the proportion of the various ingredients; and, secondly, the methods of mixing and applying them.

"In order properly to apportion the quantity of lime necessary to be used with the ballast, it will be well that you ask yourself this question,—what are you, in reality, doing when forming a mass of concrete? or rather what *ought* to be done? To this the answer must be, that you are building a stone wall; in a manner, it is true, possessing advantages entirely its own, but still a stone wall. The pebbles, then are *the materials with which it is to be built*, and must be regarded only in that light, so that in considering the quantity of lime necessary to be added, in order to form a *proper mortar* wherewith to unite them, regard must alone be had to the sand contained in the ballast, and according to the quantity and quality of that ingredient must be apportioned the lime. It is true, that upon the proportion borne by the pebbles in the mortar, the strength and goodness of the concrete materially depend,—but this, except under peculiar circumstances, must but little interfere with the preparation of the mortar; it is another question, separately to be considered.

"Now, practice and a variety of experiments have shown, that Dorking stone lime being ordinarily good, will form a most excellent mortar when mixed with three times its own quantity, by measure of sand; and, although it is quite certain that if it be well burned, ground, and used hot—and thus it *must always be* for concrete—it will make excellent mortar; when mixed with four of sand, even better, if the lime be powerful than with less, the former may serve us as generally admitted good proportion. With respect to the amount of stones essential to a good concrete, it is generally maintained by those practical men who have thought upon the subject—unfortunately but few—that it should be double that of the sand by measure:—and my own experience fully bears out this belief."—p. 14.

Mr. Godwin gives his opinion not only as to the materials, but the mode of preparing them:

"The methods of mixing and applying concrete are several, having each its advocates, and opponents; the one most generally employed, and, as I shall attempt to show, the best, is, thoroughly to mix the lime, previously ground with the ballast in a dry state; sufficient water being then thrown over it to effect a perfect mixture, it should be turned over at least twice with shovels, if oftener, so much the better—put into barrows and wheeled off for use *instantly*. It is generally found advisable to employ two sets of men to perform this operation, say three in each set; one man, to be engaged in fetching the water, &c., while the other two turn it over to the second set, and they, repeating the process, turn it over to the barrow-men. Sometimes, instead of mixing the materials in a dry state, the ballast is spread out and wetted with water, then covered with the proper proportion of ground lime, and turned over as before.

"After being put into the barrows, it should at once be wheeled up planks, so constructed as to gain a fall of some yards, and thrown into the foundation,—which has the mechanical effect of driving the particles closer together, and giving greater solidity to the whole mass."—p. 22.

The rest of the essay is chiefly occupied with an account of the various applications of concrete to building purposes, and of the peculiar processes of Mr. Ranger, the patentee of the artificial stone, whose only essential difference from common concrete is that the water made use of is previously heated, which causes it to *set* almost instantaneously. This portion, as well as those we have quoted, show that Mr. Godwin has exercised great industry in the accumulation of facts: a task the more difficult, since, as he observes, while every architect knows *something* about concrete, very few know anything on the whole subject. Previous to the appearance of Mr. G.'s paper there existed no collected body o[f] information concerning it; a conside[r]

tion which ought to atone for the defects, as well as enhance the merits, of the opening article in "The British Architects' Transactions."

ON HYDRAULIC AND COMMON MORTARS. BY GENERAL TREUSSART, INSPECTEUR DU GENIE.

[Translated from the French by J. G. Totten, Lt. Col. of Eng. and Brevet Col. United States Army, for the *Franklin Journal.*

(Continued from page 383.)

ART. III.—*Experiments on several hydraulic limes of the environs of Strasburg, on the Metz lime, and on Boulogne pebbles (continued).*

It is seen that after a certain quantity of sand has been added, the mortars lose much of their tenacity: and that for every degree of calcination, trass considerably augments the resistance. It is remarkable that mortars made of lime, sand, and trass, are in general better then those made with lime and trass, without sand: I have, however, found some exceptions. Mr. Vicat thinks that puzzalonas only slightly energetic, suit best with hydraulic limes; but my experiments do not support this opinion; as the trass I used was very energetic, and it will be seen that I always had very good results on mixing it with very hydraulic lime. I obtained, in the above table (see p. 382), better results with Obernai lime, trass, and sand, than with Obernai lime and trass without sand, and it will be seen, by experiments which follow, that I found the like results with fat lime. In the 7th number of the *Memorial de l' Officier du génie* I have advanced that, in important constructions, it is not prudent to employ hydraulic lime without a little trass. Mr. Vicat is of a different opinion: for we see a note in the *Annales des Mines*, Vol. X., page 501, wherein he says that the success which has attended the use of hydraulic lime in different works which he cites, ought to suffice to undeceive those who partake my fears as to the insufficiency of hydraulic lime without trass, in important constructions. I have, nevertheless, had an opportunity of seeing the concretes used at the canal *Saint Martin*, at Paris, and at the basin of the *Palais Royal*, made of the hydraulic lime manufactured by Mr. Saint-Léger, and they are much less hard than those made at Strasburg. I do not doubt, however, that the concrete employed at the *Saint-Martin* canal, will well fulfil its object. Being obliged to cover all the bottom of this canal, which has an extent of about 4400 yards, with concrete, in order to keep the water from filtering into the cellars of the inhabitants, it would have much augmented the expence, to have added to this mortar, cements analogous to trass. Concrete composed of Obernai lime and sand, without trass, was often used at Strasburg, for the foundations of revetments, of piers of bridges, &c.; but by "important constructions" I meant locks and dams, which have a great pressure of water to sustain, perhaps for a long time. There is no doubt that if such a work were executed with gray lime like that of the preceding table, there would be nothing to fear: but this would require the rejection of a great part of the kiln, and would make the mortar very dear: the extremes, only, can be rejected, so that the lime used is a mixture of the three qualities. If a mean be taken of the three kinds of mortar found under Nos. 3, 10, and 17, we shall have 276 lbs. for the result, while the mean term of the three numbers 6 13 and 20, is 467 lbs. I have often, however, had results much weaker than those of the above table, as will be seen in the sequel. I have even had occasion to remark that hydraulic limes coming from the same quarry, and appearing to be calcined nearly to the same degree, have, nevertheless, given very different results: in these cases, the lime which, mixed with sand had given me a weak resistance, had always afforded a very good mortar, when I used sand and trass with the lime, I am convinced that these last mortars have given, on an average, a resistance more than double the first; I persist, therefore, in thinking that in important constructions, such as locks and dikes, which have constantly a strong pressure of water to support, it is prudent to put a little trass, or some analogous substance into the mortar, even when the hydraulic lime used is as good as the very good hydraulic lime of Strasburg. It is for the Engineer who has the work to execute, to examine the quality of the lime he is to employ, in order to fix the quantity of these matters to be added in the mortar. In my opinion a Government should not regard a light additional expence, when the object is to obtain constructions that will last a long time without needing repairs: unfortunately the contrary system, which I think a very bad one, most commonly prevails.

I ought to premise that in the experiments which I shall report, I shall abstain from conclusions too general. With the limes of Alsace I have often noticed contradictory results, and even, as before mentioned, with limes from the same quarry. We have not, as yet, collected enough facts to establish a general theory: that which may be true as to the limes of one country, may not be true as to those of another. I give the results which I have obtained. It is very desirable that Engineers who have some leisure, should

make experiments; as it is only when a great many results shall have been collected that we shall be able to deduce any general principles: those which I shall present must be considered as belonging only to the limes which I shall use.

I now proceed to report other essays upon other limes of the environs of Strasburgh.

TABLE III.

No. of the mortar.	Composition of the mortars.	No. of days which they took to harden in water.	Weight which they supported before breaking.
1	Altkirch lime alone, in paste	10	268 lbs.
2	do. slaked to powder and measured in powder 1; Common sand 2 } 3	12	174
3	Lime the same 1; Sand the same 1; Trass 1 } 3	4	539
4	Lime the same 1; Trass 2 } 3	4	535
5	1st Villé lime alone, in paste	25	119
6	Lime the same, slaked to powder and measured in powder 1; Sand 2 } 3	28	68
7	Lime the same 1; Sand the same 1; Trass 1 } 3	4	473
8	Lime the same 1; Trass 2 } 3	4	473
9	2d Villé lime alone, in paste	25	110
10	Lime the same, slacked to powder and measured in powder 1; Sand 2 } 2	28	114
11	Lime the same 1; Sand 1; Trass 1 } 3	4	396
12	Lime the same 1; Trass 2 } 3	4	475
13	Rosheim lime alone, in paste	6	484
14	Rosheim lime, slaked to powder and measured in powder 1; Sand 2 } 3	14	209
15	Lime the same 1; Sand 1; Trass 1 } 3	4	462
16	Hochfeld lime alone, in paste	12	207
17	do. do. slaked to powder and measured in powder 1; Sand 2 } 3	22	136
18	Lime the same 1; Sand 1; Trass 1 } 3	4	429
19	Verdt lime alone, in paste	8	484
20	do. do. slaked to powder and measured in powder 1; Sand 2 } 3	10	279
21	Lime the same 1; Sand 1; Trass 1 } 3	4	510

TABLE III.—*(continued.)*

No. of the mortar.	Composition of the mortars.			No. of days which they took to harden in water.	Weight which they supported before breaking.
22	Lime the same Trass	1 2	3	4	310
23	Oberbron lime alone, in paste			10	264
24	Same lime measured in paste Sand	1 2	3	10	220
25	Same lime do. Sand	1 $2\frac{1}{2}$	$3\frac{1}{2}$	8	352
26	Yellow Bouxviller alone, in paste			10	299
27	Grey do. do. do.			30	99
28	Blue do. do. do.			40	79
29	Yellow do. measured in paste Sand	1 2	3	10	286
30	Lime the same Sand	1 $2\frac{1}{4}$	$3\frac{1}{4}$	10	187
31	Lime the same Sand	1 $2\frac{1}{2}$	$3\frac{1}{2}$	10	165
32	Lime the same Sand	1 $2\frac{3}{4}$	$3\frac{3}{4}$	12	132
33	Lime the same Sand	1 3	4	12	99
34	Gray Bouxviller lime, measured in paste Sand	1 2	3	25	77
35	Blue do. do. do. Sand	1 2	3	30	66
36	Yellow do. do. do. Sand Trass	1 1 1	3	5	407
37	Metz lime alone, in paste			15	169
38	Metz lime slaked to powder and measured in powder Sand	1 $1\frac{1}{2}$	$2\frac{1}{2}$	16	312
39	Lime the same Sand	1 2	3	16	262
40	Lime the same Sand	1 $1\frac{1}{2}$	$2\frac{1}{2}$	16	176
41	Lime the same Sand	1 3	4	18	143
42	Lime the same Sand Trass	1 1 1	3	4	466
43	Lime the same Trass	1 2	3	4	262
44	Lime the same Trass	1 3	4	4	385

Observations on the experiments of Table No. III.

The Altkirch lime comes from a lime-stone which is grayish: all the others from stones that are blue, like to those of Obernai and *Metz. All were slaked to* powder with one-*fifth their volume of water,* and left in that state *for twenty-four hours,* before making them into mortars. Several being too remote to be brought into use at the works, I contented myself with some experiments on their hydraulic properties. It is seen that the Altkirch lime is good. The piece of lime brought me had, probably, been out of the kiln a number of days, which should considerably influence the result, as will be

soon seen. It is possible, therefore, that this lime is better than the experiments indicate. Two different kinds were brought from Villé. I was told that it was as good as the Obernai lime. The first kind is brown, and the second grayish: we see that the resistances are feeble. The limes of Rosheim, Hochfeld, Verdt, Oberbronn, and Bouxviller gave very good results whether alone or in mortar. It will be seen, also, that with the limes slaked to powder and measured in that state, mortars consisting of lime and sand, generally supported less weight than the lime alone. It is possible that there was too much sand in them. I began with the principle, admitted by several engineers, that it is better to err by excess of sand than by excess of lime; but it appears this is not always true, for the experiments of tables Nos. II. and III. show that when the mortars had a little too much sand, their resistance was much diminished. It is possible also that some hydraulic limes may become harder when alone, than when mixed with any proportion of sand whatever.

The Oberbronn lime was measured in paste; it appears that with two and a half parts of sand, it gave a better result than with two parts only, and that this result was superior to that obtained with the lime alone.

As the Bouxviller lime might be used at Strasburg I treated it with more detail. We see that this lime loses much by being too much burned, and that it cannot support as much sand as that of Oberbronn; and, also, that with all these limes the mortars were much improved by adding trass to the lime and sand. It is an error, therefore, to suppose that energetic puzzalonas are not adapted to good hydraulic limes. Tables Nos. II. and III. show that different limes take very different proportions of sand. Thus, as before observed, various experiments induce me to believe that pieces of lime from the same quarry may give very different results, although calcined to the same degree. It also appears that different degrees of burning require different proportions of sand; it becomes, therefore, difficult to fix accurately the proportion of sand which should enter the mortar.

The above experiments were a first essay only: I proposed making others, with a mixture of lime calcined to different degrees, and to repeat the experiments on several burnings, so as to be able to take a mean. At Strasburg we adopted one part of lime to two and a half parts of sand. The mortar was good, but it, possibly, was not the best *that could be made*. Supposing the best *proportions*, as to hardness, were one part of quick lime to two parts of sand, it would still remain to determine whether these proportions should be adopted; because, if in putting a little more sand the result should be but slightly inferior, it might be done unhesitatingly, if the economy were sensible. I was about to make these experiments on the different limes of the environs of Strasburg, when I was obliged to quit the place, in consequence of the new functions to which I was called.

Towards the end of the table, are the experiments made with Metz lime. It appears that one part of lime in powder, and one half of sand, is the mixture which gave the best result, and that it is stronger than the lime alone. Notwithstanding the mortars were made in the month of June, the hardening was slow: and experience teaches that mortars harden sooner in this season, than in winter. The comparisons of No. 42, 43 and 44, shew that for the hydarulic limes of Alsace, better results are obtained with sand and trass, than with trass alone. No. 44, which was made with one part of lime in powder, shews that this lime will bear a good deal of trass without losing much of its resistance.

In the above table, the limes used alone, and in the mortars, came from the same piece of limestone, in each case.

I shall conclude my observations on Table No. III, by saying that in the course of my experiments, I have had occasion to observe, more than once, that discordant results were obtained when I used lime that had been slaked for several days. When I made the experiments with the Oberbronn lime, Nos. 23, 24 and 25, I put aside a portion of the lime in powder which I had used. At the end of fifteen days, I repeated the experiments recorded at Nos, 23 and 25; for No. 23, which was lime alone, the hardening required thirty days instead of ten days, which were necessary, when the fresh lime was used. At the end of the year, the piece of hydraulic lime, broke with a weight of 154 lbs., while No. 23, which was made immediately, supported, before breaking, a weight of 264 lbs. As to the mortar made of one part of lime, measured in paste, and two and a half parts of sand, the same as mortar No. 25, the hardening required twenty-five days instead of eight days, and the mortar broke with a weight of 154 lbs., while that of No. 25, made immediately, supported 352 lbs., before breaking. I put this lime aside for fifteen days, to see if an old saying of masons, that lime loses its energy in the air, had any foundation. The experiment convinces me that the saying is true, at least as regards the hydraulic limes that I treated;

but I wished to see, also, what results I should obtain, with mortars made in the same manner and of the same piece of lime, but at different times. I made, in consequence, the following experiments:—

TABLE No. IV.

No. of the series.	Composition of the mortars.		Made immediately.		After six weeks.		After 2½ months.	
			hardening.	weight supported.	hardening.	weight supported.	hardening.	weight supported.
			days	lbs.	days	lbs.	days	lbs.
1	Yellow Obernai lime slaked to powder and measured in powder. 1 Sand.................... 2	3	9	187	15	44	25	22
2	Lime the same.............. 1 Sand .... 1 Trass..................... 3	3	6	407	6	407	6	297

Observations on the experiments of Table No. IV.

To make the above experiments, I took the yellow Obernai lime, and slaked it to dry powder by throwing on ⅕th of its volume of water. I gave it time to cool, and then made two mortars: one, with one part of lime measured in powder and two parts of sand; the other with one part of lime in powder, and one part of sand, and one of trass, the mortars remained in the air during twelve hours, and I then put them in water, where they remained one year, at the end of which time they were broken. The table shows that the mortar of lime and sand, hardened in nine days and supported 187lbs. before breaking; it shows also, that the mortar containing lime, sand and trass, hardened in six days, and supported 407lbs. At the end of a month and a half, I repeated the same experiment, using, in powder, the same lime which had served in my first experiment, and which had been lying in an open vessel. I followed, for the second experiment, the same process as for the first: the table shews that in the mortar composed of lime and sand, the hardening was slower, and the resistance much less; and that for the mortar containing trass, the result was the same: again, at the end of two months and a half, I repeated the experiments, using the same lime slaked to powder. The table shows that the hardening was still slower, and that the resistance was still less in the mortar composed of lime and sand; for by the expression —22, is meant that it could not sustain the weight of the scale-pan, cords, and collar, which was twenty-two pounds. It also shows that the mortar containing trass experienced a sensible diminution in its resistance, although the time of hardening was the same, but the diminution was not as great as in the mortar made of lime and sand only.

(To be continued.)

THE WEATHER DURING JANUARY.

An interesting paper was read a few days ago by M. Toulouzan to the Academy of Marseilles, on the temperature of the month of January in different parts of Europe. He takes the Alps as a kind of central station, and remarks that, on the southern or southwestern slope, in the bason of the Rhone, the frost and cold that occurred after the 6th was marked first by snow falling on the 10th. On the 13th the Rhone began to carry down large masses of ice, and on the 14th was blocked up by them firmly at Avignon, and on the next day at Arles. This day, which was that of the greatest cold, saw the thermometer fall, along the course of the river, at Geneva to 20 below zero of Reaumur, 13 Fahrenheit; Lyons, 15 R., 1 7-10 below zero F.; Valence 10 R., 9 5-10 F.; Avignon, 8 R., 14 F.; Arles, 7 R., 16 2-10 F.; Marseilles 5 R., 20 7-10 F. The Rhone was never before remarked to have been frozen over at a lower temperature than 12 R., 5 F. On the western and north slope of the Alps, in the basin of the Loire, the thermometer fell to 7 below zero of Reaumur, 16 2-10 Fahrenheit, on the 9th, and the river began to bring down ice. The cold went on increasing till the 19th, when the therometer stood as follows along the course of the river:—Nantes, 19½ R., 11½ below zero F.;

Tours, 15 R., 1 7-10 below zero F.; Bourges, 12 R., 5 F.; Moulins, 9 R., 11 7-10 F.; Le Puy, 7 R., 16 2-10 F. In the basin of the Seine, the advance of the cold was nearly the same as in that of the Loire, and the therometer gave the following results on the 19th:—Havre 16 ½., 4 below zero, F; Paris 12 R., 5 F.; Melun, 9 R., 11 7-10 F.: Auxerre, 7 R., 16 2-10 F.; being very similar to those obtained on the Loire. At the same time the therometer in London was at 19 R., 10 below zero F. On the northern slope in the basins of the Rhine, Meuse, and Scheld, the cold came on rather later. The navigation of the two latter rivers was stopped on the 11th, and the Rhine was blocked up at Manheim on the 16th, The greatest cold was on the 16th, when the thermometer stood at Middleburg at 19 R., 10 7-10 F.; Antwerp, 16 R., 4 below zero F.; Brussels, 14 R., ½ below zero F.; Coblentz, 13 R., 2 7-10 F.; Manheim, 12 R., 5 F.; Strasburg, 9 R., 11 7-10 F.; and Constance, 7 R., 16 2-10 F. On the eastern slope in the basin of the Danube snow fell so abundantly on the 9th in Hungary, that it lay more than a yard deep all over the country. Higher up the course of the Danube, however, the snow was replaced by heavy rains, which melted the snow nearer the Alps, and caused floods almost as powerful as those of 1830. These rains however seemed to have stopped the cold which did not extend much towards the East. On the west of the Alps a thaw began on the 24th, commencing at the Ocean, and extending with the west wind to the Alps. From these facts it is inferred that the Mediterranean repelled the cold coming from the Alps, but that the Ocean did not produce the same effect in this respect as the inland sea; on the contrary, the cold was more intense in England. It should be observed that the western side of the Alps has been influenced by the dry cold coming from the north-east, the prevalent winds having been from that quarter. Here, however, they produced opposite effects to what they did in Provence; for, in the former instance, they brought the dry cold of Russia, and, in the latter, they came charged with humidity, and an elevation of temperature from the Alps.—*Galignani's Mess.*

JOYCE'S HEATING APPARATUS.

Few inventions or discoveries in the arts of life have so promptly and generally attracted public attention as the stove recently exhibited at the Jerusalem Coffee-house; and it is worthy of remark, that this has been accomplished without advertisement, and apparently without any of the expedients to which recourse is had usually, and almost inevitably, to stimulate public attention. Until within a few days from the time at which we write (19th February), the source of heat in this contrivance was not disclosed. It is now known to be charcoal. The contrivance is, in fact, a small charcoal fire, contained in a cylindrical stove, having proper orifices below for the admission of air, and an opening above, of the nature of a register, regulator, or damper, to allow the escape of the air which has passed through the fire. This regulator may be varied in its form; but its purpose is to increase or diminish the draft through the fire-place, and thereby govern the heating power of the stove. The small fire-place is enclosed in a cylindrical case of thin copper, the bottom of which is open for the admission of air. The whole apparatus, therefore, takes the external form of a pillar surmounted by a dome, at the vertex of which is the regulator. The inventor engages that a stove of this kind, six inches diameter, and eighteen inches high, will evolve sufficient heat to maintain a room twenty-five feet square, and twelve feet high at a comfortable temperature in in winter. It will not require to be fed with fuel more than once in the day, and the daily expense will not exceed fourpence. The air which has passed through the fire place is permitted to escape through the regulator into the apartment; and there is neither flue nor chimney. The stove is consequently, moveable, and being small in bulk, and light in weight, may be transferred from room to room without difficulty. Since the combustion of common charcoal would be attended with the production of carbonic acid in such quantity as to render the air of the apartment unfit for respiration, it is evident that, if this stove be not injurious to health, the combustible must be previously prepared by some process, the result of which is to cause the carbonic acid to be absorbed and neutralized. It is probable that the charcoal is prepared by being soaked in a solution of some chemical substance; that when the liquid has penetrated its pores, the charcoal is then dried by exposure to intense heat. The water of the solution is thus driven out, the chemical matter remaining in the pores of the fuel. When the charcoal is then burned, the carbonic acid, instead, of passing out through the damper, enters into combination with the substance mixed with the charcoal, and forms a carbonate. We have known charcoal to be burned in a small moveable stove without a chimney with impunity, by being previously soaked in a solution of pearl-ash, and well dried. There is still, however, a circumstance attending Joyce's stove, which is difficult to be accounted for. It is understood that there

are little or no ashes, or other residuum, from the fuel. Now, it is not easy to perceive how any alkaline substance can combine with the carbonic acid, without a very considerable product being formed. Lime has been mentioned, and it has been said that the charcoal is previously impregnated with that substance. Now, one pound of charcoal will, by its combustion, produce about three pounds and two-thirds of carbonic acid; and to absorb this, about four pounds and two-thirds of lime would be necessary. Thus, the charcoal would have to be impregnated with nearly five times its own weight of lime! Again, supposing this to be done, the product of the combustion would be carbonate of lime, and we should have about eight pounds of this substance for every pound of pure charcoal consumed. So that the residuum would be more twice the weight of the prepared combustible. Ammonia is apparently too volatile for the purpose. If there be, as is stated, a very trifling residuum, the product of the combustion must escape through the regulator in a gaseous form, and must, therefore, be mixed with the atmosphere of the apartment.—*Monthly Chronicle.*

DR. LARDNER'S STEAM-ENGINE INDICATOR.

At the last annual meeting of the British Scientific Association, held at Liverpool, a grant of money was placed at the disposal of a committee, to investigate the actual performance of steam vessels with reference to their speed, consumption of fuel, and other circumstances affecting their general efficiency. This investigation arose from a discussion which took place in the mechanical section, in the course of which statements the most conflicting were made, even by practical men, as to the capabilities of steam vessels for extended navigation. In prosecuting their inquiry, the committee have thought it desirable to adopt some method of registering the actual performance of the vessel in a log, which will not be subject to the errors and neglect which have hitherto rendered all steam-logs more or less useless.

With this view Dr. Lardner has attempted to construct a piece of mechanism, which will enable the steam-engine itself to write the journal of its own proceedings. This mechanism is now being constructed, and is intended to be placed in the "Tagus," a large and powerful steam-ship belonging to the Peninsula Steam Navigation Company,—this Company having liberally offered to co-operate with the committee.

The circumstances on which principally the efficiency of the machinery and the vessel depends, and which it is necessary to register, are the following:—

1. The height of the barometer-guage, which indicates the state of the vacuum produced by the condenser.
2. The height of the steam-guage which indicates the actual pressure of steam urging the piston.
3. The height of the steam-guage which indicates the actual pressure of steam in the boiler.
4. The number of revolutions of the paddle-wheels per minute.
5. The depth of water in the boiler.
6. The degree of saltness of the water in the boiler.
7. The rate of the vessel.
8. The draught of the vessel or her immersion.
9. The direction and force of the wind.
10. The course of the vessel.

The mechanism now being constructed will keep a self-recording register of the first six of these. A provision is, however, made for subsequently adding means of registering the seventh and eighth, should it be found desirable to do so. The consumption of fuel will be easily determined by keeping an account of the quantity of coals delivered into the vessel at each port, making an allowance for what is consumed in the steward's room, kitchen, and cabins.

A float is placed on the mercury in the barometer-guage, from which a rod proceeds, to which the pencil is attached. As the column of mercury rises or falls the pencil receives a corresponding motion, and being pressed against the paper on the cylinder leaves a trace upon it, which measures the extent of the variations of the mercurial column.

The heights of the steam and other guages are registered in the same manner by other pencils.

The entire apparatus will be enclosed in an octagonal case, about three feet and a half high, and three feet diameter. It will be locked by the agents of the owners when the vessel starts on her voyage, and will not be opened till her return. It will require no other attendance during the voyage than that of winding the clock.

The several pencils will be of different colours, so that their traces may be easily distinguished one from the other. Besides which it will be arranged that their play may be confined to different parts of the cylinder.

At the end of each voyage the paper will be removed from the cylinder, and replaced by a clean sheet.

If it be thought advisable, the indications of the several curves traced by the pencils

may afterwards be translated into the ordinary language of log-books.

It is not improbable that an anemoscope and other apparatus may be contrived, by which the direction of the wind and the course of the vessel may likewise be recorded, at least with as much precision as they are now ascertained by other and less regular expedients.

If this mechanism should succeed in attaining the objects for which it has been contrived, besides its valuable scientific results, it will be productive of great benefit to the proprietors of steam-ships, by supplying to them a never-failing check on every one concerned ln the management of the vessel. Thus any relaxation of attention, or want of skill on the part of those in care of the fires, will be indicated by the third pencil. Any neglect in feeding or blowing out the boilers will be indicated by the fifth and sixth pencils. The attention to the state of the condensing apparatus will be shown by the first pencil.

In the event of the temporary suspension of the operation of the machinery for adjustment, or any other cause, the fact of such suspension, its duration, and the time it took place, will be also recorded.

By the connection of all the indicators with the time-piece, the exact hour, or indeed minute, of each registered circumstance will be recorded.—*Monthly Chron.*

NOTES AND NOTICES.

Dinner to George Crane, Esq.—On Friday the 23d ult., a public dinner was given at Swansea, to Mr. Crane, the inventor and patentee of the application of anthracite coal to the smelting of iron ores. Mr. Crane was invited by public requisition from upwards of one hundred mineral proprietors and others, interested in the successful results of his valuable discovery, and one hundred and fourteen sat down to an excellent dinner to commemorate the event. The practical application of Mr. Crane's discovery has now been fully tested, by the experience of its results for upwards of twelve months at the Yniscedwin Iron Works, and that gentleman has successfully developed the peculiar adaptation of anthracite coal to smelt iron ore. His success will,we trust, stimulate others to the application of this very valuable fuel to other branches of trade. Already we hear that the experiments are now in progress, and we have every reason to believe that ere long the economical application of this coal for the generation of steam in marine engines will be proved beyond a doubt. In fact,when the component parts of anthracite coal are fully considered, containing as it does more of the pure principle of carbon than any other known fuel, it is impossible to resist the conviction that it is destined to act a very important part in the manufactories of this country.—*Cambrian.*

Steam Navigation Across the Atlantic.—We understand that an attempt is about to be made to cross the Atlantic from Liverpool to New York with a steam ship built in London, and called the "Columbus." It is expected here in a few days, The mode of generating steam in the "Columbus" (if what we have heard is correct) is altogether different from that in common use, the steam being generated by means of heated quicksilver, [Howard's plan] which, as is very well known, retains for a long time any temperature to which it may be raised. The experiment will be a very bold and novel one.—*Liverpool Times.*

Improvement in Window Sashes.—Mr. R. B. Cooper, inventor of the patent spherical stoppers for bottles, jars, &c., the styloxynon, and several other useful articles, has just devised a most ingenious method of superseding the counterpoises and sash-lines for windows. The principle will be invaluable in one of its proposed applications, viz.: to the windows of stage coaches, omnibusses and railway-carriages; for as there is no *shake*, the present disagreeable and eternal rattle of the windows will be for ever silenced, and conversation rendered audible within the carriages, while carried on in the ordinary tone of voice. As it is probable that a patent will be secured for this simple and effectual contrivance, it would be unfair to enter into any further particulars at this time; suffice it to say, the proposed method is not only superior to, but also actually cheaper than, the old fashioned method of fitting and hanging windows.

London, March 12, 1838. W. B.

Bookbinders Alphabet Scales.—Sir,—I must confess I was somewhat surprised at the statement of Mr. Birch (p. 400), that the "Scale of Alphabets" communicated by me in your 760th Number, "has been in use among bookbinders for the last thirty years." Having for above eighteen years, been more or less in communication with the principal binders in London, and never having yet met with a workman who had seen *a scale like mine*, I naturally conceived it to be *original*, as on my part it most assuredly was. At all events, *this scale* has been but imperfectly known, and its publication in your pages is very likely to add considerably to its sphere of usefulness. Yours respectfully,

March 12, 1838. W. BADDELEY.

American International Copyright Law.—This law, which seemed to be *progressing* rapidly when first introduced, and especially when the petition in its favour was presented, from all the celebrated poets and novelists of "the old country," seems at present as far from being passed as ever. The publishers of the States have taken the alarm, and got up a most strenuous opposition to the measure, which also appears to be any thing but popular among the patriotic members of the Chamber of Representatives. Meanwhile, Mr. Poulett Thomson is about to bring in a similar bill in our own House of Commons. This will, doubtless pass; but the difficulty lies on the other side of the water; not only of the Atlantic, but of the channel; since, for one foreign book reprinted here, there are at lest a hundred of ours reproduced in France, Belgium, and Germany.

Mechanics' Magazine, Complete sets.—The proprietor of the Mechanics' Magazine has now effected the repurchase of the earlier portions of the stock of this journal from the parties who were possessed of the same in the right of his first publishers; and he is now able to supply several complete sets of the work. Price, twenty-seven volumes, half-cloth, £11 7s.

LONDON: Printed and Published for the Proprietor, by W. A. Robertson, at the Mechanics Magazine *Office, No.* 6, Peterborough-court between 135 and 136, Fleet-street.—Sold by A. & W. Galignani, *Rue Vivienne, Paris.*

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MR. KEMP'S APPARATUS FOR RAISING SUNKEN SHIPS.

Fig. 6

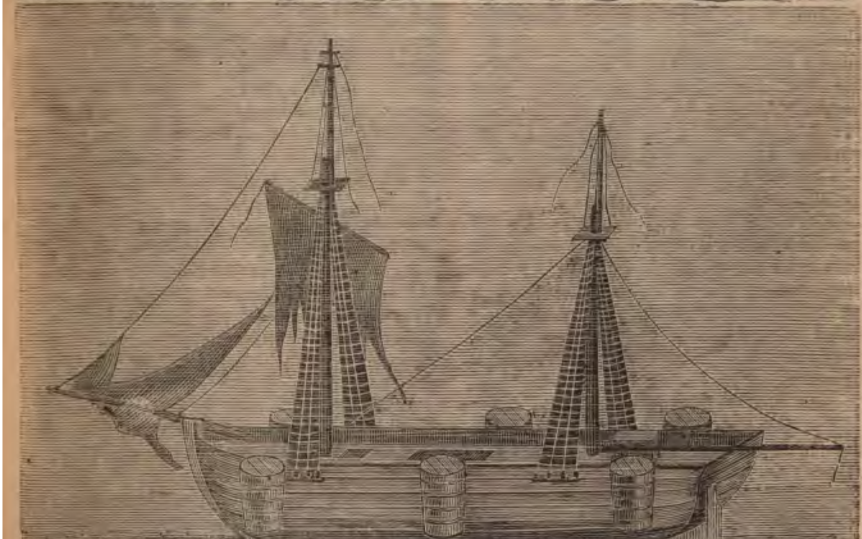

Fig. 5

MR. KEMP'S APPARATUS FOR RAISING WEIGHTS IN WATER.

Fig. 1

Perhaps no art has engaged the attention of the ingenious more, or with less success, than the means of lifting heavy bodies in water. The Thames during the past year has afforded ample scope for science and speculation; and the attempts made and assertions uttered, prove how meagre is yet the state of knowledge as regards lifting *heavy* sunken ships. It has likewise shewn of how little effect are the means usually employed for this purpose by our dock-yards.

Such being the case, any invention that appears likely to afford means for lifting any ship that may be sunk, either for the sake of saving property that would otherwise be lost, or of removing it out of the way of the navigation, is deserving of every encouragement, and the inventor of every assistance that can be afforded.

Mr. Kemp's invention, for which he has obtained a patent, is very simple in its construction. The machine for lifting consists of a cylindrical vessel open at one end, which open end has a loose head moveable easily inwards and inside the vessel, and which head is of a material lighter than water, in order that it may float between the air and water inside the vessel, and serve as a head for the lower end when the vessel is full of air. Across the open end is an iron bar sufficiently strong to bear the weight of the vessel filled with water if suspended to it, without bending; to this bar is attached the weight that is intended to be raised. A tube which is connected with an air-pump is attached *under the open* end of the cylinder (*which in the* water will always be downwards,) so that any air that may be forced down the tube will immediately, on leaving the tube, ascend into the machine, and take the place of the water at the upper end of the cylinder, and give a buoyant power which may be increased till the cylinder is full of air. The extent of the power is only limited by the size of the cylinder.

What particularly recommends this invention for lifting weights in water is, that its power may be accumulated to any extent, either by increasing the size or number of cylinders; and that the motion of the waves will not affect the action of the cylinders, as they are under the surface of the water. The buoyant power, also, will continue for any length of time, provided the vessels be perfectly air-tight. The tide also will have no effect in either increasing or decreasing the buoyant power, it being always the same as long as the vessels are under water from the lowest depth to the surface; the air inside the cylinder being more or less compressed, according to the quantity of water above it, which is demonstrated by the engraving on our front page. A ship is represented with 6 cylinders attached, at the depth of 60 feet, at which depth the cylinders must be one-third filled with air. As soon as sufficient buoyancy is obtained to move the ship, the whole will gradually rise to the surface: but until there is a sufficient floating power in the cylinders the whole will remain at the bottom; as soon as a balance is obtained, the least additional quantity of air forced into any one of the cylinders will cause the ship to commence ascending, and the air in the cylinders will expand as the ship rises,

and the air is relieved from the pressure

of the water, until the whole floats upon the surface, as represented in the upper part of the engraving, (figs. 6 & 4.) If the machines be properly attached and regulated no part of the sunken ship will move until there is sufficient buoyancy attached to move the whole to the surface. In applying the apparatus to each particular case, it will be necessary to calculate what portion of each cylinder should be filled with compressed air at the depth of water in which the weight to be raised lies, so that the air shall just expand so as to fill the cylinder when floating on the surface; should too much air be forced into each cylinder, the buoyant power will only be exerted until the air expands to the full of the cylinder, when it will stop, at whatever height in the water the weight may have attained.

The principles upon which Mr. Kemp states his invention to be founded are as follows :—"The power of raising is solely attributable to the elasticity of atmospheric air, and to the non-elasticity of water. Water, being a non-elastic fluid, will naturally cause a body that may be sunk, to rise to the surface as soon as it shall have been made lighter than water, by any elastic fluid attached to it. Any body heavier than water, may, in water, be made specifically lighter than water, by attaching a sufficient portion of air to it; therefore any body that can have a sufficient quantity of air attached, may be raised in water. Air is an elastic fluid capable of being condensed to any extent, and though condensed to ever so great a degree, and confined to ever so small a space, by the pressure of a height of water above it, is still capable of supporting the same weight in water; the greatest weight in water may, therefore, be made of the *same weight as water*, and should the quantity of air, or power of lifting, be then increased in ever so small a degree, the air will raise the body supported to the surface of the water; and should the weight supported, or power of sinking, be increased in ever so small a degree beyond the floating power, the weight will again take the air, &c. to the bottom of the water."

Description of the Engravings.—Fig. 1. A A, represents the machine, a cylindrical vessel open at the end B, with a moveable head C, which must be of a material lighter than water. The vessel A A, has a tube D, attached to it at E,

which is connected to an air pump F, by which air is forced down the tube, and which will, as soon as it leaves the tube, rise naturally inside the vessel A A, taking its place at the upper end G.

Figs. 2, 3, 4, are machines charged with air, with the weight attached. Fig. 2 is the cylinder at the depth of sixty feet, charged with as much air as will fill it at the surface of the water, which is compressed into one-third of its original space. Fig. 3, represents the same at the depth of thirty feet, the air expanded to one half the space it would occupy at the surface; and Fig. 4, represents the machine at the surface of the water, quite full of air, and supporting the weight attached. Figs. 5 and 6, represent a wreck with the apparatus attached. Fig. 5, shews the wreck at sixty feet below the surface of the water, and with the machines properly charged with air just beginning to rise. Fig. 6, shews the wreck as it would appear immediately afterwards, floating at the surface and supported by the patent apparatus.

We understand that Mr. Kemp exhibited a working model of his apparatus to Col. Pasley, who, in consequence, formed a most favourable opinion of the invention. There are few more capable of forming a correct judgment upon the subject, as well from his general acquirements as a man of science, as his practical knowledge of this particular subject. Colonel Pasley states, "I consider the invention to be very ingenious, and founded upon correct principles, and I have no doubt of the practicability of using it with success on a great scale, under many circumstances; but I am not prepared to say, whether it is such as ought to supersede the old method hitherto generally used, and often with success, by the Royal Navy, namely, that of weighing a sunken vessel by means of two or more large lighters or hulks, connected to the wreck by chains. The superiority of either must depend upon its comparative economy, which can only be judged of by a fair trial. Mr. Kemp's apparatus has the advantage of being less dependent than the former upon the rise or fall of the tide; and it appears to me to be so promising, that I should like to see it tried on a sufficiently large scale to judge of its merit, which I think might with propriety be done by employing some small man-of-war in the experiment, because the hire of a vessel and seamen, over and above one or two expert divers, which would be absolutely necessary, would exceed the means of a private individual, and the question is one of public importance."

We hope that Mr. Kemp will soon be enabled to put his invention to the test of experience.

COMPARATIVE ADVANTAGES OF IRON AND WOOD ROOFING FOR HOT-HOUSES.

Sir,—In your magazine of Feb. 24, is a paper on the relative merits of wood and iron roofs for stoves, greenhouses, &c., by J. Thompson. Permit me to make a few remarks thereon, knowing that these observations unexplained or unanswered, are calculated to create in some minds a prejudice against the use of iron, notwithstanding it possesses so many advantages, and is, for the purposes referred to, now coming into so general use.

In constructing a building in which durability is an object, the thought of using wood (except on account of primitive expense, and that in a judicious erection does not increase as may at first be supposed,) is seldom or never entertained. Mr. T. in his comparison of the two substances, evidently underrates the difference. Wood may be weathered, throated, and painted, and yet its liability to decay but little decreased; and more particularly in the situations now under consideration, where it is exposed to the effects of the most extreme changes, both of temperature and moisture, externally and internally, as well from artificial heat within, as a scorching sun without, the action of which heats, by drying its internal vessels, fits it for the more rapid reception of the great element of its destruction—moisture.

The sliding lights of a forcing or greenhouse have also an enemy to contend with in friction, which, in this material soon abrades the sliding surfaces, and gives additional facility for the entrance of moisture and its consequences. The rafters equally partake of this action, and of course in the effect. This extra absorbing power of wood abraded by friction, is aided by the

capillary action of the vessels of the wood, which draw an unceasing supply of moisture until they are filled; heat operating during the time in the dilation not only of the material, but of the moisture with which it is fully charged, as a necessary consequence the sashes are frequently set fast, neglected and decayed. The framing and fixing of wood in these situations being generally in contact with brick, which is a powerful absorbent, retaining moisture, increases the evil; and these parts cannot, from their position, receive any aid from coatings of paint. An instance came lately under my notice, in which the external surface of a wood framing by continual coating with paint presented the appearance of soundness, but the parts in contact with brickwork were completely decayed and channelled out. Flashings are introduced horizontally with some limited effect, but their application laterally seldom can be efficient. One, and the only, advantage I know wood to possess is, exemption from corrosion, to which iron is of course liable. I know well the great inconvenience and vexation which result from the dropping of an oxide upon a choice plant; I am also aware it will destroy the leaf or whatever other part it may fall upon; but in a metallic erection, surely with its many advantages, this one objection may be obviated. Moreover, the same liability exists in many parts about wood roofs. For instance, iron is constantly applied thereto in the shape of ornamented columns, truss and tie work, pulley frames, hooks and stays, whose presence is often disregarded by many gardeners until their attention is called thereto by their effects. If, then, these parts require more frequent painting, an iron roof altogether having less than one-third the surface necessary for strength compared with wood, cannot be so objectionable on this account.

Your correspondent describes the difficulty he experienced in forcing down the sliding lights in summer, and attributes it to expansion. Here he ought at least to have furnished a section of the rafter and sliding light, that its ill construction might be seen, for ill-construction is evident, as the thickness necessary for strength for a cast-iron rafter for a moderate width of house will not exceed three inches, the expansion of which under an increase of heat of 180° (and no house is ever exposed to that extreme,) will only amount to $\frac{1}{300}$ of an inch, its width being its jamming surface. Also in speaking of the contraction of the light from frost,—supposing it to be 3 feet in width (a medium size,) the contraction under the same abstraction of caloric will amount to but $\frac{1}{75}$ of an inch, a trifle too unimportant to produce such an effect.

The same also applies to the loss of heat thereby. Expansion or contraction, if there were 50 feet lights, would not produce openings sufficient to account for it: other causes were undoubtedly in operation. Mr. T. states the powerful effects of 18° of frost, and mentions that the expansion and contraction produced openings sufficiently large to counteract or neutralize the effect of *two* strong fires and prevent the rise of even 3°. Does not this bear upon its face evident symptoms of something much more powerful than the effects of expansion and contraction only, in a house 40 feet long, 16 feet wide, and 9 feet high? It would appear that there existed an equal difficulty in raising the heat to the same 3° in the wood house.

From this I can only conclude that something is egregiously wrong either in Mr. T.'s furnace or warming apparatus, whichever it may be, for he gives us no specific information. He speaks certainly of the *flues* in the iron house being heated to the greatest excess—but regarding the wood he is silent. When a matter of so much importance as the condemnation of the use of iron in greenhouses, &c. is Mr. Thompson's object, he should have backed his assertions by stating minutely the superficies of glass, wall, and *wood*, or, glass, wall and *iron;* the aspect or bearing of each house, also its elevation with respect to the surrounding country (the aspect particularly is a matter of no little importance, being, as I have found, favourable or otherwise to the amount of 10°);—the manner of application of heated surface, whether of flues, hot water pipes, or steam,—the superficies of ditto—and whether above or below the ground line;—the size and shape of boiler, quantity of surface exposed to the action of fire; construction of furnace, and length of chimney; draft and section of ditto. These par-

ticulars are all necessary—if for no other purpose—to guide the practical man, that he may avoid the results Mr. T. states he witnessed.

Further, Mr. T. proceeds to assert that in *equal* sized houses prepared expressly for the purpose of experiment, the expense of repairs was nearly double in the iron compared with the wood, in 12 months. Will he here also state the particulars *observed during* the progress of this experiment (a most interesting one); whether these repairs were fractures of glass or iron, or what they were? If of glass, the date of observation, whether under the influence of heat or cold; the degree externally and internally, and *sketches of fracture*, a most important point. If of iron, then a sketch of the sashes, rafters, curb plates and gutters, &c. if any, with sections, and general manner of the construction. All these minutiæ are involved in this experiment, and must have been observed (if conducted properly,) or sufficiently so to be of future use to the practical man, for whose particular instruction Mr. T. writes. If these particulars be withheld, how then can we benefit, not knowing what to shun, or what to continue? The knowledge of the cause is the forerunner of the remedy.

Respecting the health of plants, pines, &c., Mr. T. has himself stated the remedy, at once simple and in constant use, being nothing more than moisture and ventilation.

Of the consumption of fuel, it is utterly impossible for the want of the minutiæ before stated to be able to trace the cause. It would be unjust to infer (having no evidence before us) that all the expenditure stated resulted from an iron roof. Allow the use of copper sash bars in wood outer frames, instead of iron, and the breaking of glass, with the sundry other evils complained of by expansion and contraction, is increased, not lessened; the expansion of copper in relation to iron being as 19 to 13. Knowing copper sash bars in wood frames to be in frequent use, I have strong reasons to deny the fractured glass to proceed from expansion merely. In page 264, vol. 19, of your valuable Magazine, is a description of an iron conservatory erected for Mrs. Beaumont, of Bretton Hall. *It is therein* particularly stated, that *not the slightest* accident from any cause happened to it from the time of its erection in 1827 until the death of Mrs. B. in 1832, upon which occasion it was removed. Respecting this very erection, I have heard stated that no small sum was incurred in repairs during that period, and upon reflection, we may very well allow it to be so, for (if it be a fact) I can conceive *unequal* expansion from two different causes. The curbs and cornices being of cast iron in very much larger bodies than the sash bars which were attached to them, might effect it; or the very figure of the conservatory might powerfully tend thereto, (being spherical, or, I may say, doubly so, one dome being elevated over another,) the sun's rays might be concentrated upon a point; thus, doubtless, extreme heat beating upon one part, and not at all, or very little, affecting another. In thus considering this subject, proving wood to have its peculiar disadvantages, and iron being open at present to a share, it remains for those who prefer the combination of lightness, ornament, and durability, to trace the precise nature of the operation upon iron of those elements with which we have here to do, and which renders its use liable to censure.

In conclusion, I may mention, that on a small scale, in the same situations as greenhouses, we constantly use, without fear, iron hand glasses; and nearer still, over our very dwellings iron skylights, iron lanthorn lights, and iron sashes, without experiencing any ill effect. These, although trifling instances of the advantages of iron, are full to the point, corroborating the principle I must contend for, viz. that (in these situations) iron is infinitely superior to wood; and freedom from the evils now attached to it is attained by *attention* to *relative proportion* and *method* in erection.

Z.

DREDGE'S PATENT SUSPENSION-BRIDGE CHAINS.

Sir,—The construction of bridges at the present moment is not unimportant, nor is it undeserving the close attention of scientific and practical men, especially as the numerous tests already extant are ample proofs of the capabilities of iron as a material for their construction.

It is evident that there is an error in the present mode of constructing suspension bridges, as many of them have fallen with their own weight, and others have yielded with barely one-tenth the load they ought to have sustained.

I am satisfied that in most instances half the material generally used, in proportion to their versed sines, is not only superfluous, but very destructive. And were iron compression and suspension bridges *mathematically constructed*, they could be made more substantial at one-half, and in many instances at one-fourth, their usual cost.

Some experiments were made in Bristol with a view of ascertaining the difference of power between the parallel, and taper suspension chain invented and patented by me, in the presence of several eminent commercial, scientific, and literary men, with attendant engineers to superintend the uniform loading of the model bridges, and the results of which are as follows:—

1st trial, Jan. 6th. Two models, one on each principle, 4 feet 6 inches span, versed sine or incurvature 6 inches, the chains consisted of 9 oz. of wire each (exclusive of the roadway supporters.) Parallel chains bore 13 cwt. 3 qrs. and 25 lbs., the taper chains bore 1 ton 14 cwt. 1 qr. and 25 lbs. and both broke on adding the subsequent 1 cwt. 2d trial, Jan. 13th. Two models as before, parallel chains bore 13 cwt., the taper chains 1 ton 13 cwt., and each broke on adding the subsequent ½ cwt. 3rd trial, Jan. 13th. Two models made by Mr. Cross of Bristol, of equal portions of materials. Parallel chains bore 1 ton 3 cwt. 2 qrs.; the taper chains bore 3 tons 1 cwt. 17 lbs., and each broke with another ½ cwt.

The wire throughout on the taper principle was reduced one size by the experiment. It now remains for scientific men to demonstrate why the same result should not take place in the largest chain piers and bridges.

I am, Sir,

Your obedient servant,

JAMES DREDGE.

Bath, 14th March, 1838.

RAILWAY MILEAGE.

Sir,—In a recent number of Mr. *John Herapath's periodical*, some enquiries of a particular nature were made by a gentleman at Manchester, and replied to by the Editor. One of the replies appears to me to be so incorrect, and at the same time likely to produce so serious an inconvenience to a vast number of individuals, that I do not hesitate to request your attention to the subject, although perhaps a matter more particularly concerning the Journal in question. The query I allude to (propounded by the gentleman at Manchester) was this. "What is the general arrangement when one company travels on another's line, as the Grand Junction do now on the Liverpool and Manchester?" The following is the Editor's reply. "We believe every line, or nearly so, is compelled to receive the trains of other lines, and of any other parties, under certain regulations. It is, indeed, their interest to do so. Whenever lines or parties run upon others' lines, they commonly use their own locomotives and carriages, as if running on their own lines, and pay a toll of 2d. per person per mile, and so much per head per mile for cattle, and per ton per mile for goods, according to the description of cattle or goods; or they pay a certain sum per head and per ton, whether they run the distance proportioned to the charge, or less. The Acts fix the maximum rates, allowing the proprietors of the line to take less if they please. The times of starting trains on foreign lines are left to private arrangement, and generally are settled by the engineers." The Editor continues, "Hence, as a friend well versed in these matters observed to us, 'If the companies are disposed to make their line a monopoly, the fixing of the rate of tolls is, in effect, a bar. For if A (finding his own trains) can run on B's line at 2d. per head per mile, which we have heard is the case on the Birmingham, A might run against and under B on the latter's own line. And should any unreasonable attempt be made to fetter A, in the times of starting, or otherwise, an application may be made to Parliament, on public grounds, against B, which would remove it."

I submit that this is literally nonsense. The facts are these. The London and Birmingham Railway Company, by their Act, are obliged to register in a book the tolls taken on the railway, the highest toll as fixed by their Act of Parliament, being d2. per head per mile for each passenger,

1½d. for each beast, &c. &c.; but the reason of this book or registry being kept is, not to prevent a monopoly, but, that the overseers of the poor may charge their rates on the railway in the same manner as they do on the turnpike roads; for which purpose the books are open to the overseers twice a year. This railway at present is charging about 1¾d. per head per mile; the toll, of course, in consequence of the company paying to themselves, being quite nominal. Now, should another party, B, attempt to run against the company (A), B would be charged the whole 2d. and have also to pay for locomotive engines, carriages, &c. &c., and the repair of the same, so that to make the smallest profit, he must charge fares twice as heavy as those of the company; but should A, to avoid the parish tax, sink the tolls to a mere nominal amount, the number of carriages that would instantly start on his line would soon bring him to his senses, especially as those tolls must be *equal all over the line.*

I shall, in all probability, return to this subject, and give such extracts from the "Act" as immediately bear upon the points discussed.

I am, Sir,
Yours respectfully,
CHRIS. DAVY.

No. 3, Furnival's Inn,
March 20, 1838.

VICAT'S TREATISE ON MORTARS.

Captain Smith has done good service to the useful arts by presenting the English public with a translation of Mr. Vicat's valuable work on cements.* It may be objected, indeed, that an immense number of the details of the work refer so exclusively to the state of things in France alone, as to be of little importance in a country so differently circumstanced as our own, and that this should have suggested an adaptation rather than a complete translation of the volume. The objection is certainly not without some weight. The French author seems to have paid a singularly small degree of attention to the matters relating to his subject on this side of the channel, or, indeed, anywhere out of *la belle France* itself: but the numerous and excellent explanatory notes supplied by Captain Smith at the foot of nearly every page serve amply to make up for the deficiency, so far as the English reader is concerned. It may still be urged that a great part of the text might have been retrenched, referring as it does to such purely local circumstances as to appear little better than mere *surplusage* out of the immediate sphere of the original scene of Mr. Vicat's labours: but probably the translator considered it better to preserve the full integrity of the work, even at the expense of a little space, than to run the risk, by compression, of omitting some essential, though minute, particulars. Any way, Captain Smith can only be charged with having done too much, which is surely, in a translator, a much more pardonable sin than the commoner one of doing too little.

The French appear, of late years at least, to have much more closely investigated the nature and properties of lime than the English, though it may probably be asserted, with truth, that the latter are by no means correspondingly backward in their *practical* acquaintance with the subject. Still, no apology, as Captain Smith observes, is required for his "endeavour to extend the usefulness of Mr. Vicat's researches, by submitting them to the (English) public in a more accessible form." These researches, he informs us, proved of signal service in the course of his public duty, in India, where the construction and repairs of numerous public buildings fell to his share. The want of such a work as Mr. Vicat's may not be felt so much among the builders of England, who, by dint of extensive and long-continued practice, now inherit a sort of instinctive knowledge of the subject; but it must often have been bitterly experienced in such situations as that in which the Captain was placed at Madras; and a little theoretical knowledge, such as Mr. Vicat most abundantly supplies, can do no harm to the most experienced "practical men"

* A Practical and Scientific Treatise on Calcareous Mortars and Cements, Artificial and Natural; containing, directions for ascertaining the qualities of the different ingredients, for preparing them for use, and for combining them together in the most advantageous manner; with a theoretical investigation of their properties and modes of action. The whole founded upon an extensive series of original experiments, with examples of their practical application on the large scale. By L. J. Vicat, Engineer in Chief of Bridges and Roads, &c. &c. Translated, with the addition of explanatory notes, by Captain J. T. Smith, Madras Engineers, F.R.S., &c. &c. London, Weale, 8vo., p.p. 328.

at home. It ought to be welcome to all concerned in the arts of construction.

One of the principal objects of the work is to point out the merits of what is termed "hydraulic lime," or lime which sets rapidly under water, which has recently come into most extensive use in France, and which Mr. Vicat pronounces to be superior to the English cement, respecting which, however, his information appears to be remarkably scanty. The most valuable portions of his researches are those in which he gives the means of distinguishing between the common, or "rich," and the "hydraulic" limes; means which, as Captain Smith informs us, led him to "the discovery of an excellent water-lime superior to the Aberthan in setting power, which existed in abundance in the immediate neighbourhood (of Masulipatam), but whose properties had been hitherto altogether unknown." Now that the methods of discriminating it are indicated, it appears that this lime exists in almost every locality. "Twenty years ago," says Mr. Vicat, "we knew hardly a dozen localities in France affording hydraulic lime. Now we are no longer able to reckon them. Wheresoever we have been sent to look for it, there it has been met with." Nor is it necessary that this valuable material should exist ready-made in the bowels of the earth. Our neighbours have a method of manufacturing artificial hydraulic limes, for which, we believe they are indebted to Mr. Vicat himself. His third chapter is devoted to a description of the process which is well worth attention; and which we shall extract by way of a specimen of his treatise:—

"Six years have elapsed since the publication of my first researches into this subject; and already the artificial limes have been applied to a number of important works. The canals of St. Martin and Saint Maur made almost exclusive use of them. Nearly a thousand cubic metres have been employed within five years at the harbour of Toulon. These limes have served for the fabrication of the beton for the foundations of several bridges; and their consumption is increasing daily in Paris and its environs.

"We have no longer, therefore, to attend to laboratory experiments, but indeed to a new art, very nearly arrived at perfection.

"The artificial hydraulic limes are prepared by two methods; the most perfect, but also the most expensive, consists in mixing with rich lime slaked in any way a certain proportion of clay, and calcining the mixture; this is termed artificial lime *twice kilned*.

"By the second process, we substitute for the lime any very soft calcareous substance (such, for example, as chalk, or the tufas) which it is easy to bruise and reduce to a paste with water. From this a great saving is derived, but at the same time an artificial lime perhaps of not quite so excellent a quality as by the first process, in consequence of the rather less perfect amalgamation of the mixture. In fact it is impossible, by mere mechanical agency, to reduce calcareous substances to the same degree of fineness as slaked lime, nevertheless, this second process is the more generally followed, and the results to which it leads become more and more satisfactory.

"We see that by being able to regulate the proportions, we can also give to the factitious lime whatever degree of energy we please, and cause it at pleasure to equal or surpass the natural hydraulic limes.

"We usually take twenty parts of dry clay, to eighty parts of very rich lime, or to one hundred and forty of carbonate of lime. But if the lime or its carbonate should already be at all mixed with clay in the natural state than 15 parts of clay will be sufficient.

"There is at Meudon, near Paris, a manufactory of artificial lime set on foot by Messrs. Brian and St. Leger. The materials made use of are, the chalk of the country, and the clay of Vaugirard, which is previously broken up into lumps of the size of one's fist. A mill-stone set up edgeways, and a strong wheel with spokes and felloes, firmly attached to a set of harrows and rakes, are set in movement by a two-horse gin, in a circular basin of about two metres ($6\frac{1}{2}$ feet English) radius. In the middle of the basin is a pillar of masonry on which turns the vertical arbor to which the whole system is fixed: into this basin to which water is conveyed by means of a cock, they throw successively four measures of chalk and one measure of clay. After an hour and a half working, they obtain about 1.50 metres cube (nearly 53 cubic feet English) of a thin pulp, which they draw off by means of a conduit, pierced horizontally on a level with the bottom of the basin.

"The fluid descends by its own weight; first into one excavation, then into a second, then a third, and so on to a fourth or fifth. These excavations communicate with one another at top. When the first is full, the fresh liquid, as it arrives, as well as the supernatant fluid, flow over into the second excavation; from the second into the third,

and so on to the last, the clear water from which drains off into a cesspool. Other excavations, cut in steps like the preceding, serve to receive the fresh products of the work, while the material in the first series acquires the consistency necessary for moulding.

"The mass is now subdivided into solids of a regular form by means of a mould. This operation is executed with rapidity. A moulder working by the piece, makes on an average five thousand prisms a day, which will measure about 6000 cubic metres (211.8 cubic feet English.) These prisms are arranged on drying shelves, where in a short time they acquire the degree of desiccation and hardness proper for calcination. This may be effected by any one of the methods described in the preceding chapter. At Paris they employ a mixture of coke and coals and the common mode of burning by slow heat, rendered necessary by that kind of combustible."

It will be observed that the translator takes care on every occasion to give the English equivalent for the French measures; this is done very scrupulously throughout the work. Captain Smith also illustrates the passage we have just quoted with several notes, which give completeness to the text: the most important one, on the present occasion, being a sketch of the component parts of the best English cements—a material which Mr. Vicat seems inclined to mention as little as possible. In every point of view the translator has executed his task in a manner which does him the highest credit.

MR. DAVENPORT'S ELECTRO-MAGNETIC ENGINE—CALCULATIONS ON ITS POWER AND CAPABILITIES.

Sir,—Although it is some years since I was a contributor to your eminently useful and widely circulated work, I have not ceased to feel a great interest in it. It is now nearly twelve months since I first heard of Mr. Davenport's electro-magnetic engines, and have ever since been in anxious expectation of seeing them brought into use in this kingdom. I do not impute the delay to any want of merit or to any want of power and utility in Mr. Davenport's invention: but rather to the want of discernment in those *persons whose* interest it would be to *employ it* and to the obstacles which are always thrown in the way of an ingenious inventor who does not possess wealth, or who is destitute of the means to put his own invention into practice upon a very large scale, such as would at once carry conviction of its power and utility, to the minds of the most sceptical persons, and such as would make it instantly understood, or at least its power acknowledged, by the most obtuse intellects.

I myself have made several inventions of improvements in steam-engines and in paddle-wheels; more than fifteen years ago, I invented the very plan of a wheel for which Mr. Morgan took out a patent only about three or four years ago.* But I shall relinquish all thoughts of my inventions in steam-engines as I am thoroughly convinced that Mr. Davenport's inventions will ultimately supersede the use of all kinds (at least all that are moved by steam produced from *boiling water.*)

My motive for forwarding this communication is to promote Mr. Davenport's welfare, by drawing the attention of those who may have both the inclination and the power to put his plans into operation on a large scale, for nothing less can satisfy the undiscerning and unscientific of their great importance and utility; working models of engines, I well know by experience, however excellent, or however well they may act, are seldom considered as conclusive proofs of the merits of an invention.

Although I do not estimate Mr. Davenport's engines to be so powerful as he reckons they would be, if made much larger, I nevertheless am well convinced, that according to the bulk or space occupied, they would be more powerful than the steam-engines now generally used. In order to illustrate this important point, permit me to mention the size of some of the boilers which I have seen on board certain steam-boats. When at New York about twenty-one years ago, I was on board a vessel which was 190 or 200 feet long. The boiler thereof was about 10 feet high, 21 feet broad, and 36 feet in length; containing 7560 cubic feet, or about 46,260 gallons. This boiler was made of copper, and

* Mr. Galloway is the inventor of the wheel usually called "Morgan's"; the patent for which is dated 2d July 1829.—Ed. M. M.

cost between seven thousand and eight thousand pounds. But the entire of an electro-magnetic engine although I would allow it to have three times as many galvanic batteries as Mr. Davenport thinks of, would scarcely take up more than half the space, and would be only about one third the weight and bulk thereof, for an engine of equal power.

Taking it for granted that the powers of Mr. Davenport's working models have been rightly stated, I will now proceed to submit to your readers the powers and probable results that will be produced by Mr. Davenport's engines. It will be seen that I calculate that nearly three times the number of galvanic batteries will be required which Mr. Davenport reckons upon. But should they take less than what I believe they will require, so much the better.

In No. 736, of your Magazine, it is stated, that Mr. Davenport's electro-magnetic wheel of 6-inches diameter raises 200lbs. one foot high in one minute of time; here let me observe, that this is equal to 3⅓lbs. raised one foot in one second of time; this will render my calculation very easily understood; for I shall make my comparisons of power with steam-engines making sixty strokes of the piston per minute, and the length of each stroke of the piston equal to six feet. Suppose the electro-magnetic wheel 15 feet in diameter, here the diameter is thirty times larger than Mr. Davenport's wheel, and some persons would say that the power will increase in proportion to the squares of the diameters. Here would be 30 × 30 = 900, or 900 times the power of the 6-inch diameter wheel. But it is quite clear to me, that if we increase the diameter and area of the wheel, we must in the same proportion increase it in thickness strength and bulk; and therefore, it leaves no doubt on my mind, that the electro-magnetic engines will have an increase of working power according to the cube of their increased size, and consequently for an engine whose wheel is 15 feet diameter, or thirty times greater in diameter than Mr. Davenport's working model, we shall have 30 × 30 × 30 = 27000 times the power of the aforesaid model engine. Now as it has been shown that the working model raises 3⅓lbs. one foot high for each second of time, therefore we shall have 27000 × 3⅓lbs. = 90,000lbs., one foot high per second, or 15,000lbs. 6 feet high per second, and there are very few marine steam-engines, the stroke of whose pistons are more than 6 feet; I therefore consider this as a good standard of comparison.

But there is one great and decided advantage of Davenport's engine, which is that the circular motion originates itself, without the aid of a *crank*; and it must be well known to every engineer who is a mathematician, that in every steam-engine worked by a crank, one half of the power of the piston is lost by the conversion of the rectilinear motion of the piston into the circular motion of the fly wheel. It therefore appears to me only just to consider that in an engine on Mr. Davenport's plan with the wheel 15 feet diameter, the aforesaid 15,000lbs. would equal 30,000lbs. with a piston stroke of 6 feet, and reckoning one horse power at 200lbs. it would make the said engine equal to 150 horses' power, and following as nearly as may be the proportions for the model engine mentioned in No. 736, of the *Mechanics' Magazine*, the size of each of the galvanic batteries would be about 7 feet diameter for the largest or external concentric tube of zinc and copper, and about 9 feet high. But suppose the electro-magnetic wheel to be 25 feet in diameter, equal fifty times the diameter of Mr. Davenport's wheel; then we shall have 50 × 50 × 50 = 125,000 equal to the cube of 50, and 125,000 multiplied by 3⅓lbs. will give 416,666lbs. lifted 1 foot high per second of time, equal to 69,444lbs. lifted 6 feet high per second, equal to 347 horses' power reckoned as before. But as I have before observed that this power is obtained by a circular motion without the aid of a crank, it may fairly be reckoned equal to double the amount, or 694 horses' power of a steam-engine. There cannot be a doubt that this power would be constantly supplied by eight circular or rather cylindrical galvanic batteries, each about 10½ feet diameter in the external tube, or by three such batteries 16½ feet diameter; and as the wheel is placed horizontally, the batteries could be placed on a stage or floor immediately above or below the wheel, so that the whole apparatus would not occupy any more of the bulk of the ship than the space required for the

wheel. Even if the copper and zinc tubes were made sufficiently strong to last six or seven years, the whole cost would not be more than about one-fourth part as much as that of a steam-engine of the same power, and the fuel would not only be saved, but also the space required for four hundred or five hundred tons of coals. The actual cost of thus navigating a large ship from England to the East Indies, would not exceed thirty or forty pounds, and would be performed in six weeks time instead of three or four months as at present. Whoever will give himself the trouble to investigate the merits of Mr. Davenport's discovery cannot for a moment doubt of its ultimately superseding steam, to which it would be found vastly superior for long voyages.

I remain, Sir,
Your's respectfully,
THOMAS OXLEY,

Teacher of Astronomy, &c., 3, Elizabeth-place, Westminster-road,
March 13, 1838.

THE EXPLOSION ON BOARD THE VICTORIA STEAMER—MARINE ENGINE MAKERS OF LONDON AND THE OUT PORTS.

Sir,—In the Weekly Dispatch newspaper of Sunday last, it is stated, that the engines and machinery of the steam ship "Victoria," on board of which the late calamitous accident occurred, were manufactured by Messrs. Napier and Co., of Blackwall.

Now, as the engineers of London have been extensively engaged in manufacturing marine engines for the last twenty years, without a single accident occurring to human life by the bursting of boilers or defects of machinery; as a Londoner I felt grieved that this disgrace should have occurred to them; although it is melancholy to reflect that occurrences of this kind have been by no means so rare at some of the outports. You may judge then, Sir, how agreeably I was surprised to find upon enquiry, that these engines and boilers were *not* made in London, nor is there any manufactory in London belonging to the above firm that I can discover, where engines or boilers have been manufactured; although it is true, that there is a large empty wooden shed opposite Deptford belonging to a Mr. Napier.

I find that the engines and boilers of the ill-fated ship were manufactured partly in Scotland, and partly in Hull; at which last port the vessel was built, and the engines fixed under the superintendance and from the designs of Mr. Napier, late of Glasgow; well known as the manufacturer of a description of engine, now commonly called the steeple engine, from the circumstance of a great portion of the machinery rising some 15 or 20 feet above the deck; as also for using steam of pressure three or four times greater than Messrs. Bolton and Watt and the principal engineers of London employ; which I imagine must always more or less be attended with danger. I attributed the great success and superior safety of London-made engines to the fact, that none of the engineers ever use steam for marine engines above 4lbs. pressure on the inch, and notwithstanding this pressure, the speed of their vessels is unrivalled, and their economy in point of fuel proverbial.

I think it but a common act of justice to the engineers of London to make known the above facts, as well as for the information of the public generally; and I feel no doubt that with your usual candour you will will give this insertion.

I am, Sir,
Your obedient servant,
QUID.

ENGLISH PATRONAGE OF FOREIGN ART.

Our readers may remember that, in our recent analysis of the Parliamentary Report on the Royal Mint, some space was devoted to a notice of a certain Signor Pistrucci, who enjoys a suite of apartments and a snug salary, at the expense of the British public, without condescending to render any *quid pro quo* in the shape of services. We are happy now to announce that the Signor is, at last, after a repose of fourteen years, about to favour John Bull with a specimen of his abilities as a medallist. The coronation medal of our young queen has been entrusted to his hands, and

(which is something more to the purpose) Signor Pistrucci has undertaken to execute it; so that, both parties being agreed, it is to be hoped something may be done, and that, too, in rather less time than the grand medal in honour of the British army, which the Signor has had in active preparation since shortly after the Battle of Waterloo, but which is still unfinished, and likely enough to continue so till the end of the next war.

It has excited some surprise in many quarters that the commission should have been conferred on Signor Pistrucci, while the *native* artist who executed the coronation medal of William IV.—Mr. William Wyon—stood ready to receive it. At first sight, indeed, it may seem perfectly proper, that, as the Signor receives his salary in quality of "Chief Medallist," the task should fall to his share, it being taken for granted that it would form part and parcel of his official duties. This is, however, a mistaken notion: Signor Pistrucci conceives that he pockets his salary only that the barbarous English may have the satisfaction of saying that they have an actual Italian artist for "Chief Medallist," and holds accordingly that he has no duties to perform at all. He is therefore to be paid, and to be paid handsomely, for Queen Victoria's coronation medal, his paltry fee at the Mint going on as usual, and he, as usual, doing absolutely nothing for it. It should seem, indeed, to be owing only to the rage for economy which distinguished the commencement of the last reign, that a British engraver was then employed. Signor Pistrucci was applied to on that occasion, but the sum offered he considered beneath the notice of a foreign artist of his pretensions, and Mr. Wyon was then favoured with the commission at the reduced pittance. Now that a more liberal remuneration is resolved upon, the Italian steps in again, and the Englishman is left to his own reflections on the patronage his countrymen award to native talent.

Signor Pistrucci appears not to be without his partizans among the periodical press; or, if not, it is rather strange that just at the present juncture the newspapers should teem with paragraphs speaking in a depreciating strain of the merits of the new coinage, now on the eve of making its appearance; a course the very reverse of that most usually pursued. If,—which will soon be seen—the new coin be really so tasteless in design and rude in execution as these paragraphs would lead us to believe, the circumstance will assuredly be most remarkable; since it is a well-known fact that the coinage has gone on regularly improving under the hands of Mr. Wyon, so that the recent specimens leave those produced under the superintendence of Signor Pistrucci far, far behind! The public may, *perhaps*, when the proper time comes, demur a little to the verdict of the unknown paragraphist who is so eager to forestall their judgment on the matter; meanwhile, of one thing we may be pretty certain, that Mr. Wyon has not displayed (bad) *taste* enough to place his own name at full length in the most conspicuous situations on both sides the coin!

COAL MINE EXPLOSIONS.

Sir,—A "Correspondent" with great zeal and good intention, having *discovered* a novel cause of explosion in coal mines, points out an equally novel preventive.

It is quite true, that miners' picks, the transporting the coal from one part of the mine to another, and like bustling occupations in a coal pit, cause innumerable particles of dust to float in the atmosphere thereof—displacing about as much air as the dust which floats in the hold of a collier when actively discharging, not only in the *working chamber* or chambers, for there are very many in each mine, (else the great requisition for railways, locomotive engines, and shipping, for the transport of coal from each mine, would soon dwindle into insignificance,) but in the whole course of the intricate workings of the mine, through which the dust travels very harmoniously with the current of air produced by the system of *ventilation*. Hence this dust cannot arrive at the dreaded *combustible* density by the "breathing of the men," and by "accumulation" in a stagnant chamber—it being absolutely necessary to ventilate *every* chamber in the course of working, as well as those that have been worked; for gas, I may say at all times, is oozing from the small fissures in the solid mass of coal, dis-

placing the air so as to render it explosive if not duly ventilated.

The current of air in the principal workings, or "head-ways" is so strong in many parts as to render it difficult to carry a candle, which unless in suspected places, is the common illumination of the miner, and *in his hands* is one of the best tests of the dreaded accumulation either of dust or gas—in fact we might as well expect to hear of a collier exploding, while discharging in the tiers, from an "accumulation" of dust *floating* in her hold.

Explosions are generally the result of a sudden and extensive escape of gas from some fissure in the mass, or from defective ventilation and carelessness, and *are not* rendered an atom more destructive from the presence of dust, which would be dissipated with larger and more formidable *particles* instanter.

As to the method of relief, it would be necessary, in order to steam the chambers of an entire mine, without reference to its efficacy, that as much pipe should be laid as would furnish a small town with gas or water, without the probability of the steam ever reaching to $\frac{1}{20}$ of the distance, even if an enormous boiler were in operation in the pit for that purpose—for a "correspondent" has not reflected that the *engine boiler* is, almost invariably, placed at the surface, and is very many fathoms distant from the seat of work, *down* to which steam has not a great inclination to descend even were there any to spare.

Indeed, the steaming a chamber, were it practicable or useful, would be about as futile as the attempt to dry a leaky ship.

I am, Sir,

Your most obedient servant,

NAUTICUS.

Woolwich, March 20, 1838.

CORNISH STEAM-ENGINE INDICATOR.

At a late meeting of the Institution of Civil Engineers, a paper was read by Mr. Henwood, relating some experiments which had been made on the pumping engines of Cornwall, for ascertaining the quantity of steam employed, its distribution on the working stroke, the duty accomplished, and the quantity of work done for a given cost. The first was approximated to by the use of an indicator, consisting of a cylinder of 1.6 inch in diameter, and about 11 inches long, open at both ends, and fitted very accurately with a piston, attached to which is a helical steel spring connected to the top of the cylinder, and which tends to keep the piston in the middle of the cylinder. The piston rod has at its upper end a receptacle for a pencil, and to the lower part of the cylinder is attached a cock gradually tapered to fit the grease holes in the working cylinders of the engines. On the top of the indicator cylinder is fixed a frame of wood, of about 18 inches in length, in which a board slides horizontally backwards and forwards by means of a connexion with the radius rod of the parallel motion. To this board is affixed a piece of paper, upon which the pencil, at the upper part of the piston-rod, describes straight or curved lines, according as the piston and the slider move at different times or together. These curved lines furnish accurate information as to the duty of an engine. The results of the experiments made with the indicator on on several engines are then detailed, and together with the dimensions and loads of the engines; the contents of the pumps, the pressure in the boiler and cylinder, and the temperature of the hot well, boiler shed, and external air, are tabulated with great precision.

MADRAS IRON AND STEEL MANUFACTURES.

We have been favoured by a correspondent with some information connected with the manufacture of iron and steel, which has long been carried on in the nugger division of Mysore, but which has not until very recently attracted much attention. The interest we feel in all matters relating to the products and resources of India, tending to promote the industry or ameliorate the condition of the natives, induces us to lay before our readers the substances of the communciation. Iron-stone it appears is found in great quantities in nearly every part of the nugger division, but more particularly all round the Bhowa Boodn hills, and the hills extending from Bassauapatam Ajumpoor. Numerous smelting houses and furnaces have been erected, and are in operation near Coomsi, Hollayhonoor, Benkypoor. Oobrani Terrikey, and Hingadhully. The iron most esteemed by the natives appears to be that of Sirragerry near Shemmoga, from its being more malleable than that of other places. The Oobrani iron is likewise much prized; but the richest ore seems to be that of the Bhowa Boodn Hills. Upon the summits of these hills loadstone is also to be found, from which various vessels are formed, that are superstitiously supposed by the natives to possess

many marvellous properties, and are consequently much valued by them. The most usual form in which the iron is made up for exportation, is that of small bars called by the natives coola, such as are used for ploughs, crowbars, mamotties, and pickaxes. Large boilers and cauldrons are also made when ordered, as wells as axles, and tires for cart wheels, and the ordinary price is one rupee per maund. Hitherto this trade appears to have been subjected to heavy taxes and impositions, which have during the present year been removed: formerly each foundary paid an annual tax, varying from twelve to fifty rupees, which is now abolished; and the iron was also subjected to a heavier duty at each Chowky that it passed (and which was once in about every ten miles,) than is now levied but once at the frontier. The only tax to which these manufactures are now liable, appears to be a frontier duty on exportation, of one Bahadry fanam, equal to six armas, upon each bullock-load. The beneficial effects of the removal of these restrictions and imposts are already manifesting themselves in an increase of the trade, and the establishment of several new foundries that have since been erected.—*Bombay Courier, Oct.* 28, 1837.

PRESERVATION OF MINERAL SPECIMENS FROM DECOMPOSION.

Several questions have been brought forward, as to the best method of preserving from decomposition fossil fruits, wood, &c.; and various methods have been proposed with a view of attaining that object. It has been suggested, that after washing with turpentine and lamp-oil, a thin coating of isinglass in solution may be advantageously employed On the 20th of last September, a friend brought me some fossils from Sheppey in pyrites, of which one specimen in particular was more affected by decomposition than the others. I immediately, after cleaning, gave them a dressing of turpentine and lamp-oil, recommended by Mr. Hill, and laid them in the open air to dry; but, in only two days after this, I found decomposition beginning afresh, the sulphate of iron forming upon them. I removed them into the house, wiped the lamp-oil clean off, and then gave them a coating of dissolved isinglass and spirits of wine; and, at the end of seven months after this simple process, I find that they are perfectly free from the slightest appearance of decomposition; and have every reason to conclude that, for the purposes of the cabinet at least, this process for their preservation will be found sufficient. On applying the lamp oil, I found it of little or no use in this instance: it will not dry, it fills up the fibrous appearance on the outside of the fossils, and almost destroys their beauty. The quality of the isinglass obviates this completely; and it dries almost instantaneously.—*Mag. Nat. His.*

NOTES AND NOTICES.

New Locomotive.—Messrs R. & W. Hawthorne, of Newcastle, have lately constructed a locomotive engine, invented by T. E. Harrison, Esq., of Whitburn, engineer of the Stanhope and Tyne Railway, and patented by him in December, 1836, destined for the Great Western Railway, differing most essentially from any hitherto in use. Its construction and advantages are thus described in the *Sunderland Beacon.*—1st: The machinery and boiler being placed upon separate carriages and wheels, enables the conducting engineer not only to have an unobstructed view of whatever may be likely to impede his progress, but also, from the situation of his seat, to have almost the whole of the machinery within his reach. Mr. Harrison seems convinced, from his experience on the Stanhope and Tyne Railway, that a fourth part of the expence for repairs to locomotime engines arises from the position of the machinery with regard to the boiler, parts of which are subject to considerable strain from the expansion and contraction of the boiler, and when any extensive repairs are necessary the removing of the boiler or what is called stripping the engine, is almost equivalent to rebuilding it. This the present arrangement is calculated to obviate, as well as to prevent delay to the engines when under repair, since the boiler can be detached from the engine in a few minutes, and either the boiler or engine united to another, as the failure may be in machinery or boiler.—2d: The machinery thus constructed is capable of being made more substantial, every part bearing a ratio of strength to a standing engine. An opportunity is also afforded of getting up a very considerable increase of speed (at the same time keeping down the velocity of the piston,) either by having wheels of larger dimensions, or, as in the present engine, by means of toothed wheels which gives the revolutions to the driving wheels, for each stroke of the piston, the great advantages to be derived from which can only be appreciated by those whose experience has enabled them to estimate the destruction by wear and tear attending such extreme velocity being given to the piston, not to the machinery only, but also to the fire-box, owing to the great pressure and velocity by which the steam is injected into the chimney, thereby raising the temperature of the fire to such an extent as greatly to hasten the consumption of the material it is made of, whether iron or copper.—3rd: The boiler is of the same construction as those of other locomotive engines, except in the fire-boxes, which have two doors, and is divided into two parts by a chamber or reservoir suspended from the top, which, therefore, by presenting a greater area of heating surface to the action of the fire, hastens the generating of steam without increasing the temperature.

Mechanical Horse.—Sir,—In the Arcana of Science for 1830, page 74, is the following paragraph, quoted from the *Leeds Mercury*:—"A gig drawn by a wooden horse at the rate of a mile in six minutes and carrying three passengers has been exhibited at Keighley. The mechanism from which this extraordinary vehicle receives its impulse, is the invention of Mr. Isaac Brown, of East Morton, near Bingley. The horse, though of such untractable materials, may be guided in any direction by a single rein attached to the mouth." Can you Sir, or any of your readers inform me what became of this piece of mechanism What was the principle by which this wooden ho

was set in motion? Whatever information can be afforded through your valuable Magazine, will no doubt be acceptable to many mechanics, but will be particularly so to one who is making experiments, being your attentive reader, S. HURLEIGH.

Nautilus to Iver M'Iver.—Sir,—May I beg a corner in your "minor correspondence" this week, to repeat my protest against an assumption adopted by Iver M'Iver in this day's number of the *Mechanics' Magazine*, and which is the more surprising, inasmuch as my former denial of the same assertion (when made by your correspondent O. N.) namely, that I had denied that in the latitude of Edinburgh the perpendicular must fall upon D Z produced, appeared a week previously to the date of Iver M'Iver's letter. I can find nothing in my communication in No. 251, to justify either of those gentlemen in such an assertion; on the contrary, the direct reverse is stated as plainly as words can convey it: such a coincidence in misrepresentation, is, therefore, to say the least, rather extraordinary. The patronising air assumed by Iver M'Iver in his strictures, is altogether amusing, and reminds me strongly of Malvolio

"Quenching his familiar smile
"With an austere regard of control:"

when he next enacts the critic, he should, at least, study his theme with a little more diligence. I remain, Sir, your obedient servant,

March 10, 1838. NAUTILUS.

The British Museum.—The new library and reading-room at the British Museum being now completed, and ready for occupation, the task;—no trifling one—of removing the books from their old to their new situation, has been commenced, and is now actively proceeding; this will occupy several months. The new reading-rooms are much more capacious than those at present used, which will be converted to other purposes as soon as the removal is effected. It may admit of doubt, nevertheless, whether even the increased accommodation will long be sufficient for the ever-increasing number of readers at the Museum, especially if the proposed evening reading-room be opened,—an event by no means improbable.

The New School of Design.—It is understood that the premiums to be adjudged to the pupils of the New School of Design at Somerset House, in July next, are not to be supplied from the funds of the establishment, but are the gift of private parties. There is already a monthly exhibition at the School of the drawings executed by the pupils, but we believe the public generally are not admitted.

Nearest Railway Route to Paris.—It would seem to be expected that England is to furnish not only the iron, but also the gold, for foreign railroads. The shares of the railway from Paris to Rouen and Havre are actively *pushed* in the London market, and, according to the statements of the promoters of the undertaking, have been eagerly bought up by English capitalists. Can they not find employment enough for it in the same line at home?

The New Royal Exchange.—The Committee on Metropolitan Improvements have ceased to investigate the merits of Sir Matthew Wood's plans, in order to devote their undivided attention to the subject of the rebuilding of the Royal Exchange. It is not a little singular that the estimate for the new edifice, on a becoming scale of splendour, and including the clearing away of the Sun Fire Office and adjacent houses, amounts to 200,000*l*., while the worthy Alderman proposes to effect the whole of his projected improvements, involving the pulling down of some hundreds of houses in the most valuable parts of the city, to say nothing of the purchase of Waterloo and Southwark bridges, for only *four times* the sum! It is needless to add, that Sir Matthew has "reckoned without his host" in calculating the outlay necessary for carrying his rather extensive notions into effect.

Dublin Zoological Society.—This institution has in some degree overcome the difficulties whose occurrence seemed to threaten its very existence, a short time ago. Extraordinary means, however, are obliged to be resorted to, in order to make up for the deficiency of funds under which it labours. Among these is a series of lectures on Natural History, delivered gratuitously by some of the most eminent physicians of the Irish capital, under the patronage of the Lord Lieutenant. It would be a pity, indeed, if "the second city in the Empire" should, like too many of our large provincial towns, suffer its Zoological Gardens to fall into decay after a short season of flattering success.

Something (not) *New—Another Irruption at the Thames Tunnel.*—At half-past six o'clock on Tuesday morning the appearance of the ground, and unusual noise, as if from a rushing of water into a cavity, having taken place, the engineer's attention was drawn to the peculiar circumstances, and he therefore anticipated a rush of water. Mr. Mason, one of the assistant engineers, who was then just going on duty, with some active miners, attempted to take means to prevent an irruption, but finding it useless, he thought it necessary to order the workmen to retreat, and which they did, in an orderly manner, by the safety-platforms erected by Mr. Brunel for the passage of the workmen in case of danger, and they ascended to the top of the shaft without any personal injury having happened to a single individual, although between 60 and 70 persons were in the works at the time. In about a quarter of an hour afterwards the water gradually filled the Tunnel.—Active operations were immediately commenced for filling up the aperture in the bed of the river, as a quantity of clay had been already collected near the spot, for the purpose of forming the proposed covering towards the north shore, and which is not yet completed.

The Editor observes with regret, that during his unavoidable absence from the press at one period of last month, a very absurd letter signed "David Crummell" found its way into the pages of the Magazine, with an equally absurd note signed "ED. D. D." (*Query* Ed(itor's) D(eputy's) D(evil)?) We are obliged to our friend the "Librairan" for the pains he has taken to unmask the contemptible impostor.

Mechanics' Magazine, Complete sets.—The proprietor of the Mechanics' Magazine has now effected the repurchase of the earlier portions of the stock of this journal from the parties who were possessed of the same in the right of his first publishers; and he is now able to supply several complete sets of the work. Price, twenty-seven volumes, half-cloth, £11 7*s*.

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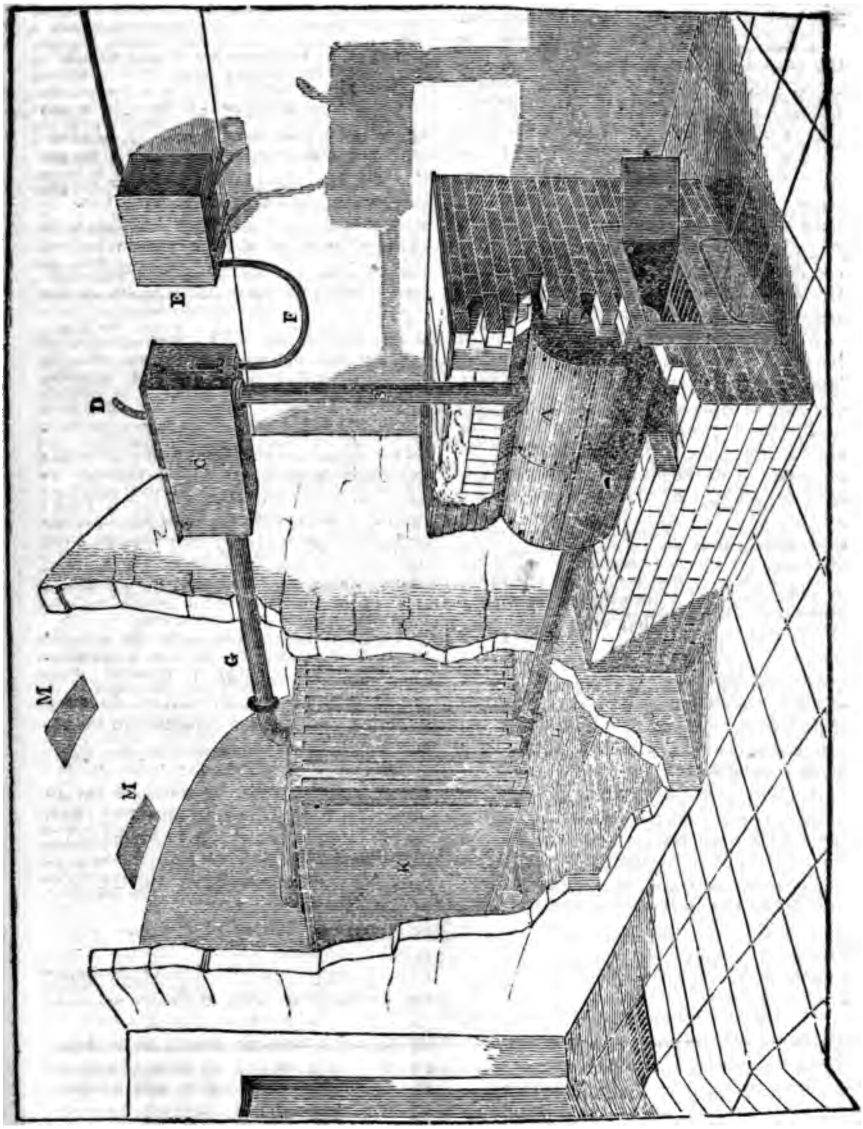


PRICE'S PATENT WARMING AND VENTILATING APPARATUS.

As warming and ventilating our private abodes and public buildings is a subject upon which considerable interest is excited at present, we this week lay before our readers an account of an apparatus which has been adopted in many public institutions, commercial offices, and private mansions in the kingdom.

The Elgin and Egyptian Galleries in the British Museum, the Pantheon Bazaar, Oxford-street, the Inner Temple Library, Barnett and Co.'s Bank, in London; the New Custom-House, and West of England Bank in Bristol; and the Mechanics' Institution in Liverpool, have been mentioned as being warmed by Mr. Price's plan. Leaving our readers to judge of the merits of the system, from the description which follows, and from the fact of its extensive use, we shall not intrude any opinion of our own.

Mr. Price's apparatus consists of a boiler, A; upright pipe, B; expansion box, C; with open steam pipe, D; feed cistern, E; syphon pipe, F; flow pipe, G; and return pipe, H; and a series of shallow flat iron cases, K, placed vertically in a chamber in the basement story of a building. All these parts of the apparatus have free communication with each other, and are filled with water to the same level. The water being raised to the boiling point (212°), a continual and rapid circulation is kept up between the boiler and series of iron cases, imparting to their extensive surfaces the power of effectually warming the thin equal streams of fresh air, which are admitted beneath them from the external atmosphere at L, and are continually flowing over them.

A moderate temperature is thus imparted to the air, which, rising to the top of the chamber, passes off by the flues M M, which convey it to the rooms to be warmed; while, at the same time, and by means of a duly-regulated system of ventilation, the vitiated air of the apartments is expelled either at the fire-places, or by orifices especially arranged for the purpose.

The limited degree of temperature to which the air-warming vessels are raised, has no tendency to change the quality or impair the purity or freshness of the air in contact with them; and the continual renewal of the air of the apartments, which is an imperative condition of the warming process, has the certain effect of expelling the breathed and contaminated air. It is this feature in the structure and operation of Mr. Price's apparatus, which distinguishes it from the ordinary system of heating by hot-water.

JOYCE'S STOVE—DR. LARDNER'S INDICATOR.

Sir,—The account of Joyce's stove extracted from the "Monthly Chronicle" is highly satisfactory, and goes far to show that it is problematical whether it can safely come into general use. I should certainly be very tenacious of employing it in a close room: but of this we have yet more to learn, and must rest satisfied of your watchfulness in the meantime.

A grand objection to most close stoves for studies, or ordinary apartments in dwelling-houses, is, that the air is liable to be rendered impure and unpleasantly respirable from contact with the hot surfaces. Nott's, Arnott's, and other stoves, although very ingenious, seem all to partake, more or less, of this defect; and I cannot see, at present, how so small a reputed surface as that of Joyce's, can sufficiently warm a large room, unless it be heated to an objectionable degree.

There is much ingenuity in the invention of Dr. Lardner's steam-engine indicator; but I fear that at sea it will be found difficult to keep in order, and thence doubtful in its results.

In the first place, the tubes of the steam guages must be much larger in diameter than those in ordinary use, which frequently require to be taken off and thoroughly cleaned, in order to permit the mercury to buoy up the *wire* or *stick* therein inserted; while those on the fronts of boilers of land as well as marine engines (except in particular cases,) are rarely seen to *act*, it being too troublesome constantly to attend to them; hence the necessity of a tube so large, and a float so heavy, as to overcome at all times the difficulties to which the present ones are liable, and to cause a pencil to travel accurately when pressed against the roller. Again, the friction

of the mercury in the present guage is so great, that by shaking it smartly, the stick might be made to rise or fall, as may be, a half inch at any time, which is another reason for larger tubes.

As to the barometer guage, it is well known to practical men, that when the stop-cock is left open, the oscillation of the mercury at sea is so convulsive, that the greater portion is often projected from the cup into the condenser: and even when not so violent as stated; it varies 2 or 3 inches in height, when rolling simply. To prevent this great fluctuation and loss of mercury, the tubes must be made longer and larger, or some other expedient devised, where the stop-cock is continually open, else the register will be of little or no use.

The counter of revolutions is well-known, and is applied to every "single action" engine in Cornwall, and to many elsewhere.

The rate of the vessel is provided for by "Massey's patent Log," on the very same principle as Dr. L. proposes; but the register of the "saltness of the water of the boilers" has yet to be explained—it is one of the most essential items.

All the ten considerations are important and essential to the desired end, and could, no doubt, be registered by a machine, at least as a matter of curiosity.

I conceive that the "Tide Gauge" at Sheerness Dock-yard, will give a tolerably good idea of Dr Lardner's proposed machine, as faintly drawn in your last number. An upright trunk, communicating beneath with the water, contains a float to which a long rod is attached; to this rod a line is fixed at each end, a turn being taken round a pulley on the wall beside, so as to cause it to turn one way on the rise of tide, and the contrary on the fall; thus a corresponding pulley is acted on and gives motion to a pencil which moves horizontally backward and forward, according to the rise or fall of tide, tracing a line on a cylinder, which obtains its motion from a clock which thus forms part of the machine.

The height of each tide and the exact time, is registered in this manner on a sheet of paper, which gives place to a blank one when filled, as proposed in the mechanical log.

It is probable that Dr. Lardner may be well aware of the difficulties I have alluded to, and may have judiciously provided for them; but a trial at sea will be the only test by which the efficiency of his machine for practical purposes can be determined.

I am, Sir,
Your most obedient servant,
NAUTICUS.

Woolwich, March 19, 1838.

THE HONEY BEE.

Sir,—Please to allow me to ask, through the pages of your useful publication, for a little information as to the management of the honey bee, knowing there are many of your readers who are practically acquainted with the subject.

I should like to know how much honey is taken from a stock of bees, both as regards the collateral hive, and the inverted hive of Mr. Nutt? And how a stock is to be put into the collateral hive after it is fumed?—Mr. N. making no mention how the honeycomb is to be taken out of the straw hive without breaking it. I should imagine it ought to be cut to pieces to extract the comb more completely, but that information I wish to have from some one that has seen it done by Mr. Nutt himself.

In Mr. Nutt's book, of which I have three editions, there ie a statement of how much honey is *generally* taken from his hives. But he seems not to be over nice in what he states as to quantity, &c. for it appears from his last edition, as to the 296½ lbs. obtained in 1826, that it included *hives* and *glasses*, a fact of which he made no mention till he was obliged by the repeated doubts expressed respecting the correctness of his original statement. It is quite evident, too, that his hives were considerably larger than what he recommends for use. It seems likely, also, that he united two or more stocks together.

I am, Sir,
Your obedient servant,
A READER OF YOUR MAGAZINE FOR THE LAST 7 YEARS.

Feb. 9, 1838.

GAS RETORTS.

Sir,—The wear and tear of retorts at our gas works having been greater than we were led to expect, I have been induced to make an investigation into the subject, and I now send you the res

in the hope that some of your readers will inform us whether our retorts are, in fact, doing a fair stroke of work or not.

Our winter demand, amounts sometimes to 9000 feet a day, and we employ 3 retorts set in an oven after the fashion taught us by Mr. Lowe, the upper retort weighing 16 cwt., and the two lower 14 cwt. apiece. The set which we think the fairest example, lasted 224 days of winter work, at the heat indicated by its having had 4½ cwt. of coke burnt under it daily, and by its having made 465 feet of gas from a cwt. of Tanfield coals, on an average.

The time which a retort ought to last, seems to be in a direct ratio with the intensity of the heat to which it is exposed during that time; and having no precise measure of heat of that intensity, I can only give a rough approximation to it, in the way which I have done. The number of feet of gas actually made cannot be the proper measure of its duty, because it is sometimes kept hot, when (for want of demand) no gas is making.

As it may be useful to compare the degree of success at one town, with that met with in another of similar size, I add some particulars relating to our gas works, and shall be much pleased to be favoured with similar information from other towns.

	Feet.
The population of Hitchin is 4,500—the quantity of gas consumed by private burners nearly..........	900,000
(Being about 200 feet per head on the whole population.)	
The street lights are estimated to burn	300,000
And we burn within the works nearly	100,000
	1,300,000

But the quantity actually made appears by our station meter to be 1,650,000, shewing a loss from escape, liquifaction, or some other cause, of about 350,000, equal to about 20 per cent.

This loss again bears no proportion to the whole quantity made, but to the extent and imperfection of the pipes.

The iron retorts, including carriage, cost of fire bricks, and all other expenses of setting, costs about 1*l.* per cwt., and make 28,000 feet of gas per cwt.

The fuel is worth two shillings a cwt., and it makes 1,190 feet of gas per cwt.

Before concluding I wish to ask a few questions respecting the *tar*, and the best mode of disposing of it. Is there any practical method of turning it into gas? What is its value as fuel? And in that respect, is it, weight for weight, of equal value with coal? Or what proportion do they bear to each other? Can the naptha be distilled from it cheaply enough to make it worth while, and how? I have heard of its being mixed with other substances, and so forming a hard brick-like material. In that combination, what are the best substances to mix with it, and in what proportions? And *what are the uses to which the compound is applicable.* From two or three *rough experiments* it seems to result, *that having* been first rid of its naptha *by boiling*, it will bear an admixture of 4 or 5 times its bulk of sand, and form with it a substance as hard or harder than brick.

I have the honour to be, Sir,
Your most humble servant,
WILLIAM HAWKINS.

Hitchin, Feb. 19, 1838.

MR. UTTING'S ASTRONOMICAL TABLES.

Sir,—I fully expected that the Scotch Dominie would have replied to Mr. Utting's letter inserted in your 754th Number. The Dominie had an easy task to perform, for Mr. Utting has himself (unwittingly no doubt) put into his hands a well-pickled rod, and all that he had to do was to give him a moderate castigation with his own weapon. Instead of doing so, the Dominie has thrown away the rod and turned his back on his antagonist. Well, Mr. Editor, as one of your oldest correspondents, I trust that I do not exceed my duty, by endeavouring to efface some of the numerous stains which Mr. Utting in his last letter has left on the pages of the *Mechanics' Magazine.*

Mr. Utting in his aforesaid letter informs us, "That the motion of the equinoxial points varies in proportion to the periodic times of the planets, and that

the formula $\frac{P\,P'}{P\pm P'}$, will always be equal to $\frac{T\,T'}{T\pm T'}$." Mr. Utting has asserted the very contrary, No. 741, page 37, col. 1. But Mr. U. is uch a finished adept in the wriggling system, that he is never at a loss to reconcile the most evident contradictions, and more particularly so when they apply to himself.

Mr. Utting gives us a solution of the question (so he calls it), "Whether the next conjunction of the sun and Jupiter is to be considered a *siderial synodic period*, or a *tropical synodic period?*"

Mr Utting first gives us a calculation for finding the synodic period of Jupiter in mean siderial days, deduced from volume 62, page 120, of the *Philosophical Magazine*, viz.—

$$\frac{\overset{\text{sid. days}}{4344.446881}\times\overset{\text{sid. days}}{366.256384}}{3978.190497} = 399.9762$$

days = siderial synodic period of Jupiter." This would have been far more intelligible had Mr. U. called it the synodic period of Jupiter expressed in siderial days. Mr. Utting, contrary to his usual way, has only extended the decimal to four places, six places, however, are absolutely necessary; the above number then becomes 399.976169: and here I will just intimate to Mr. Utting that he could not possibly have selected a more unfortunate article to answer his purpose; it completely upsets his principles, and fully establishes the truth of what the "Scotch Dominie" has so often had occasion to assert; but more of this anon. In the first place, I allow that 399.976169 is a mean synodic period of Jupiter expressed in siderial days; also it is well known that the number of siderial days contained in a periodic revolution of the earth (a revolution of 360°, mark Mr. U.,) is exactly one more than the number of mean solar days contained in the same period of revolution; hence, $\frac{366.256384}{365.256384} = 1.0027378$, that is one mean solar day is equal in length to 1.0027378 siderial days; hence, $\frac{399.976169}{1.0027378} = 398.884105$ mean solar *days. That is a mean synodic period of Jupiter may be expressed by saying that it is equal to 399.976169 siderial days, or 398.884105* mean solar days; and that these two periods although expressed by different figures, still the absolute length of time is the same in both. Now, let us assume $1.0027378 = m$, then $\frac{4344.446881}{m}$ will express the periodic time of a revolution of Jupiter measured by mean solar days; and this is what all along the Scotch Dominie has designated by the symbol P, and $\frac{366.256384}{m} = P'$; hence, $\frac{4344.446881}{m} - \frac{366.256384}{m} = \frac{3978.190497}{m} = P - P'$. Consequently, $\frac{P\,P'}{P-P'} = \frac{4344.446881}{m} \times \frac{366.256384}{m} \div \frac{3978.190497}{m} = \frac{399.976169}{m} =$ 398.884105 mean solar days, the same as that deduced from the *Philosophical Magazine;* so that in principle the Dominie and the *Philosophical Magazine* exactly agree.

Mr. Utting then goes on to deduce a value of what he calls a tropical synodic period (or what he has in his last letter re-baptized by the name of "a solar synodic period,") from the formula, $\frac{T\,T'}{T-T'}$; this he does not deduce from the *Philosophical Magazine* (although I have never seen the volume he refers to, I risk the assertion.) He states, "Lastly,

$$\frac{\overset{\text{sol. days.}}{4330.6431644}\times\overset{\text{sol. days.}}{365.242244}}{3965.4002920} = 398.8837$$

days, the solar synodic period in mean solar days. By extending Mr. Utting's decimals to two more places, it becomes 398.883709. That is, in the present question $\frac{P\,P'}{P-P'} = 398.884105$; and $\frac{T\,T'}{T-T'} = 398.883709$; both being expressed in the same denomination of time, namely, mean solar time, the difference is not great, being only 34½ seconds, and in no case where the Dominie had occasion to show the difference between $\frac{P\,P'}{P-P'}$ and $\frac{T\,T'}{T-T'}$ did he make it greater; so that I perfectly agree with the Scotch Dominie that in no case in the solar system $\frac{P\,P'}{P-P'} = \frac{T\,T'}{T-T'}$. On this subject

well as another of the same family, Mr. U. has never clearly discovered the right path In his own profession I dare say he stands high, but on astronomy, the less he writes the better.

Yours, &c.

KINCLAVEN.

THE SOCIETY OF ARTS.

Sir,—Accident has thrown in my way No. 756, of your Magazine, and having attentively perused your observations on the depressed state of "the Society of Arts," I cannot forgo the inclination of saying a few words on that subject.

It is well known, how much easier it is to condemn than applaud, and it is a fact as strongly established, that human nature is too prone to lend a helping hand to keep down the *sinking* party! Were it necessary to quote instances to establish the ascertion, I need only call the attention of the reader to page 301, of the number I have referred to of your publication. Ascertions, Sir, are easily made;—facts, also, are stubborn things. If sufficient room in the *Mechanics' Magazine* could be appropriated to "a round unvarnished tale," I think, without great difficulty, I could shew, that candour on the one hand has not much governed the writer's remarks; and that the Society, on the other, is in every way entitled to the best support and confidence of the public.

Notwithstanding the ironical manner in which you have been pleased to treat that part of the secretary's address which alludes to "the encouragement afforded to the application of science to the practical arts," it cannot be denied that the practical arts have been considerably advanced by the fostering hand of this institution. Though you admit that the Society has been in existence upwards of *eighty* years, and would confine its feats to two instances, you do not seem to be aware, that at the time it started, useful science, comparatively speaking, was in its infancy, and, though it may be your *dictum* that the Society "has had no more to do with the progress of useful science since the date of its birth, than he fly on the wheel with the movement of the coach," the contents, alone, of its repository at once negative the assertion.

At the time the Society commenced its operations, the schoolmaster was not abroad. As knowledge has progressed, so have the exertions of this institution. They *reward*, they do not *invent*. The humble mechanic has received encouragement from the Society, because something, perhaps, almost in embryo, has presented itself to his notice; and the institution has cultivated many a nucleus, until it has become a valuable possession.

You, sarcastically, observe, that "the distribution of gold and silver medals to masters and misses for the production of pretty pictures may be very pleasing to their friends, and other parties concerned, but it throws a ludicrous light over the proceeding of a solemn society"—the only part, Sir, of your philippic with which I am *not* at issue. I have my doubts whether this portion of the Society's proceedings could not satisfactorily be dispensed with. Those members who take an active part in the business of the institution, have long regarded the rewards recommended by the committee of polite arts, and sanctioned by the Society, as very likely to create jealousies; inasmuch, as in many classes, two medals can only be given to two *approved* candidates,—at the same time, it may happen, that a dozen or more may be competitors. In a society constituted like the one in question, there are many artists, and it has frequently struck me, that a candidate who may be an entire stranger, but whose production may be equal to two who happen to be pupils of any members of the respectable class of society I have alluded to, have little or nor chance. At the same time, this branch of business should not hastily be abolished when it is known to be an attested fact, that the late Mr. Flaxman, Mr. Nollekens, Mr. Bacon, and Sir Thomas Laurence, received similar marks of approbation from the Society when in their youth.

I have not been induced to notice your observations, Sir, respecting the Society of Arts, wishing to stand forward as the champion of the address drawn up by the secretary and circulated under the Society's sanction, being well convinced, that a weak defence does more injury to the cause, than leaving an illiberal attack

unanswered. No, Sir, I have been influenced by even better feelings. "A looker on," says the old adage, "sees farther than those engaged in the battle," and while the address was preparing for publication, I was convinced, owing to the uncontrolled powers of the members, that several alterations which were suggested by them, would render the original document less effective, than had a different course been pursued. Many very important, many very valuable subjects which the Society have brought into action, have been passed over, because as the address states, it would draw it to an unsuitable length.

So different, Sir, is my opinion of the Society to that which you have expressed, that I could be content to call the public attention *alone*, to the great advantages which their encouragement has afforded, not only to themselves, but to the landholder;—witness the presentation of their rewards to the late Bishop of Landaff; the late John Christian Curwen, Fyshe Palmer, Esq., *cum multis aliis*, for the growth of timber, for *their extensive plantations;* and, I would confidently ask, do their exertions go for nothing, when it is considered how much they have effected in stimulating the wealthy in reclaiming land from the sea? Inspect the Society's transactions, Sir, and then give an impartial opinion of its exertions in the cause of the "useful arts."

I do not, with you, anticipate the downfall of the Society. The day, I trust, is far distant, ere such an event takes place. The address which has afforded you such scope for censure, has acted differently with others. To my knowledge, more than treble the number of new members, taking the sum total of those elected during the last three years, have been added to the Society's list *this session*, and contributions have been tendered which have considerably liquidated the deficiency. Something, I am aware, Sir, to meet the taste of the town must be added to the routine of the Society's business—*Tempora mutantur*, &c.; and if the members will only pull together, the opportunies they will have of benefiting the public—the capabilities of the Society's premises, and their stock in hand will produce attractions which few other institutions can compete with. *Nous verrons!*

In conclusion:—though I cannot expect that you will allow me space to enumerate the various successful attempts of this institution to promote public benefit, I cannot help noticing a monstrous anomaly on your part, in the number of the Magazine, which deals out so unmercifully your anathemas against the Society.

You observe, "it may be doubted whether such an institution as the Society of Arts is ever of real utility;" and in page 296, of the same number you have copied from vol. xxxii. of their, transactions, a communication "*Wilson's window sash suspender*," stating that it had been rewarded by the Society, and recommending it to some of your readers on the score of expence, as more acceptable than the patent method, described in your work, number 711.* I, Sir, have read the fable of the Satyr, who blew hot and cold with the same breath, but I confess, that I seldom, if ever, encountered a more flagrant instance of inconsistency than displayed in the article alluded to by you.

I am, Sir,

AN ADMIRER OF THE INSTITUTION.

Burton-street, Burton-crescent, March 1838.

ARIS'S INSTRUMENT FOR MEASURING THE ANGLE OF REFRACTION OF RAYS OF LIGHT.

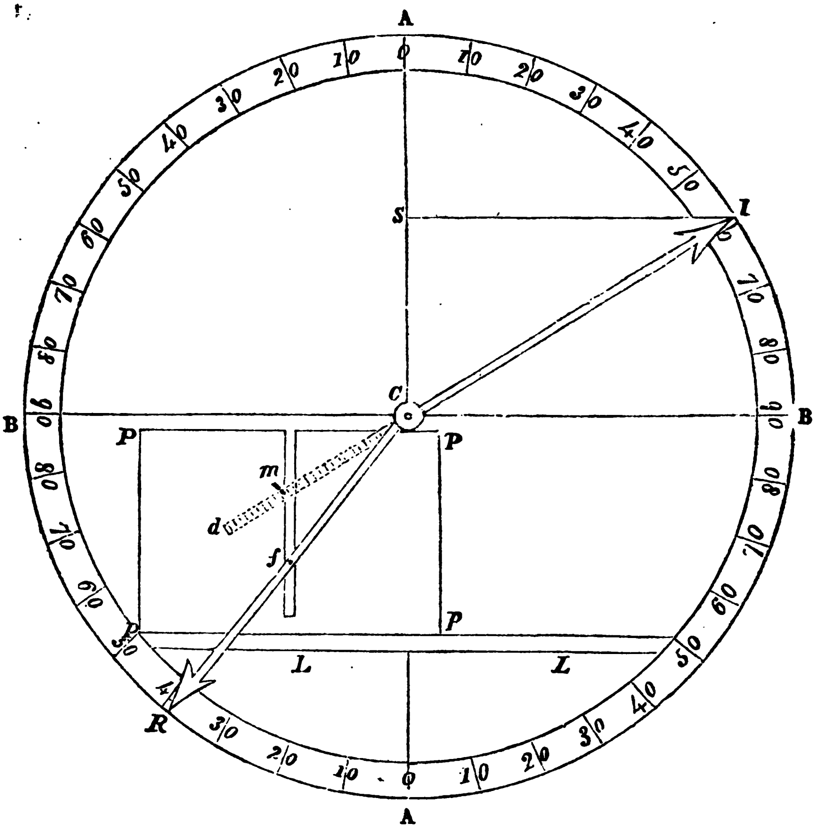
Sir,—The following is a description of a mechanical instrument that I have constructed, for finding the angle of refraction of any ray of light, in passing out of a transparent medium of any given refractive power, into any other medium of different refractive power, which if constructed on a scale sufficiently large, might be found useful to persons giving lectures on optics in illustrating the effects of the laws of refraction. In finding a place for this in your valuable Magazine, you would much oblige,

Your humble servant,

J. R. ARIS.

Sun Fire Office, March 19, 1838.

* It is only necessary to observe that the article upon which the writer of this letter rests his charge of inconsistency against us, was the communication of a Correspondent. We shall take some future opportunity of adverting to his defence of the Society.—Ed. M. M.



B A B A represent a circular frame of wood or metal, the upper half of which is divided into degrees, on both sides from the perpendicular A C, to shew the angle of incidence, the lower half is divided in a similar manner to show the angle of refraction, B C B, being the boundary of the two mediums. I C is a lever moveable on the centre C, this lever is intended to represent a ray of light incident at C. A C I the angle of incidence, and S I the sine of incidence. This lever is continued beyond C to *d*, the distance of the end *d* from C being equal to half the radius. The space between C and *d* is divided into a number of equal parts, 100 if the scale be large enough. A pin *m* is fastened on a slider so that it may be placed at any given distance from C towards *d*, this part of the lever passes behind a parallelogram *P P P P, the pin m* passing through a *groove in it, the length of the groove* being equal to half the radius, the parallelogram, being a little wider, that the solid part of it left (between the end of the groove and the edge) may be strong enough to hold the two parts of the parallelogram together. If the lever I C *d* be moved on the centre C, the pin *m* will cause the parallelogram to slide on the ledge L L. R C is another lever moving on the same centre and placed outside the parallelogram; this lever is intended to represent the refracted ray; upon it a pin *f* is immoveably fixed at a distance from C exactly equal to half the radius; this pin being fixed to the under side of the lever it passes downwards into the groove of the parallelogram which on sliding produces a motion in this lever. To represent the refraction of a ray of light in passing from air into water, the sine of refraction being 75 or $\frac{3}{4}$th of the sine of incidence, slide the pin *m* till it coincides with the division 75 on C *d*,

making the distance between C and *m* equal 75· or ¾th of the distance from C to *d*, or from C to *f* (as represented in the drawing;) this being done, move the lever I C, (which represents the incident ray) to any given angle on either side of the perpendicular A C; the doing of this will always have the effect of moving the lever R C to that angle where it will represent the corresponding refracted ray. To represent the effect of refraction from air into glass, move the pin *m* from C, till it is ⅔d of the distance of *d* from C, (the sine of refraction in this instance being ⅔d of the sine of incidence;) this being done and the lever I C being placed at any given angle of incidence, the lever R C will in like manner represent the corresponding refracted ray. The best method of adjusting the pin *m* to the refractive power of any particular medium, is to move the lever I C *d* till the end I points downwards; the pin *m* will then pass out of the groove and the graduated part C *d* of the lever I C *d* will pass out from under the parallelogram; in this position it can be done with the greatest facility. To represent the effect of refraction in passing from a dense medium to a rare, the incident ray must now be represented by the lever R C, which being placed at any given angle of incidence not exceeding the angle of total reflection, the lever I C will in this case represent the corresponding refracted ray, and if the angle made by the incident lever R C with the perpendicular should exceed the angle of total reflection, the lever I C will not in this case represent any refracted ray, in consequence of losing the support of the parallelogram, the pin *m* slipping out of the groove, which will cause the lever I C to fall down into the dense medium, thereby shewing that the angle of incidence is too great for a ray of light to pass out of any given medium into one of less density, and consequently must be totally reflected.

It is not absolutely necessary that the distance of the pin *f* from C (also the length of the groove in the parallelogram) should be exactly equal to half the radius of the instrument; any other distance would have answered the purpose; it might have been equal to the whole radius. I have chosen that of half the radius, as being the most convenient; if the distance had been greater, the sliding parallelogram must have been proportionably larger. This would have been attended with an inconvenience, that is, the pin *m* would be liable to drive the parallelogram beyond the circular part of the frame, when the lever I C was placed at a large angle of incidence. The principle on which the result of the foregoing arrangement depends is as follows:—The radius of the circle described by the motion of the pin *m*, bears the same proportion to the radius of that described by the pin *f*, as the sine of refraction does to the sine of indidence, therefore, the sine of incidence on the smaller radius, (and also the distance of the pin *m* from the perpendicular which is always equal to it,) must be exactly equal to the sine of refraction standing on the larger radius, and as the two pins are kept at an equal distance from the perpendicular, in consequence of the groove in the parallelogram being parallel to the same, the distance of the pin *f* from the perpendicular must therefore represent the sine of refraction and the lever R C the refracted ray.

I forgot to mention that there should be a screw in the slider to which the pin *m* is attached, to make it tight when it is adjusted to any given position; the pin itself might be made to answer the purpose by having a screw at the bottom of it.

OXLEY'S CALCULATIONS ON DAVENPORT'S ENGINE.—THE "VICTORIA" EXPLOSION.

Sir,—In Mr. Oxley's comparison of the powers of Davenport's Electro-magnetic engine, with the ordinary steam-engine, he has assumed 6 feet for the length of stroke of a *marine* engine (very few of which he justly observes have *more*), and a velocity of 60 strokes per minute; consequently the space passed over by the piston per minute will be 6feet × 60 = 360 feet!—Now, the utmost limit prescribed by Watt and others for the velocity of the piston of a steam-sngine is 220 feet per minute which is never exceeded in practice, except in the case of locomotives, and this is found so distressing to the working parts that the propriety of meeting the objection by reducing the speed of the engines to the above maximum, or nearly so, is seriously contemplated by those immediately interested

hence the deductions referred to, are totally incorrect.

Again, as to the "great" and "decided advantage" of the rotation without a crank:—"it must be *well known* to every engineer who is a *mathematician* that in every steam-engine worked by a crank, *one-half* of the power of the piston is lost by the conversion of the rectilinear motion of the piston into the circular motion of the fly-wheel".

Now, according to the recent *practical* investigations of the performance of *cranked* engines, by the Chevalier de Pambour, who has some *slight* knowledge of mathematics, it is shown that "the *friction* and *losses* can *never* amount to one-third of the total force developed", thus unfortunately upsetting the whole of Mr. Oxley's calculations.

Mr. O's calm resignation, after inventing Morgan's wheel, and other contrivances, "moved by steam produced from *boiling water*", is much to be commended.

With reference to the strictures of "Quid" on the engines and boilers of the "Victoria", I think that they are both ill-timed and illiberal; a fair *professional* investigation of the *cause* of the accident, that is, of the *modus operandi*, not yet being before the public.

There is no doubt that high pressure steam, (which in the river is not confined to 4lbs. per square inch) is the legitimate cause of premature bursting of boilers; but with *new ones* the engines being entirely out of the question, we must wait for a clear exposition of facts bearing on the construction and workmanship thereof, with the probable interposition of collateral circumstances, before we can *justly* condemn the productions of one, who, to judge from his works, is at least eminently ingenious.

If we look on the reputed successful application of high steam in different parts of the country, where long strokes and great expansion are employed, Mr. Napier would appear to be justified, as a scientific men, in adopting the same in the particuler instance alluded to, according to Quid's own showing, provided that the boilers were constructed, not in the manner of those in vessels usually employed in the river, but cylindrical, or so as to oppose the greatest possible resistance with a certain strength of material. It must not be understood from my remarks that I advocate high steam for marine engines, but I take up the subject merely from a desire to see it fairly and clearly investigated, and not borne down by party prejudice.

A description of the boiler, of the fractured part, and the *apparent* cause of giving way, would be desirable, in your valuable Magazine.

I am, Sir,
Your most obebient servant,
NAUTICUS.

SIR SAMUEL MORLAND, "MASTER OF MECHANICS" TO CHARLES II.

Among the small band of mechanical inventors of the olden time, the name of Sir Samuel Morland deserves to occupy a prominent position; yet few have received less notice in the historical and biographical records of his age. It was the fate of this distinguished genius to flourish in the troublesome times of the civil wars, when the dissensions of cavaliers and roundheads shook the island to its centre, and all but banished the peaceful arts of invention and discovery from their chosen abode. Sir Samuel espoused the side of the royalists, and played a conspicuous part in the arena of civil strife; yet he appears to have found leisure, and to have possessed inclination, to exchange occasionally the distractions of politics and polemics for the "*musæ humaniores*" of science. Had his lot been cast in the present day, his fame would doubtless have been great, but in the seventeenth century he was in advance of his times. As far, however, as the title of "Master of Mechanics" conferred honour or emolument, he deserved that distinction. "To rescue from oblivion the actions and writings of a man who ought long since to have held a distinguished situation in the scientific annals of Great Britain," an anonymous pamphlet has been published,* from which we extract the following particulars, in the hope that the circulation they will obtain through the medium of our pages, will tend to the furtherance of their writer's object.

* A Brief Account of the Life, Writings, and Inventions of Sir Samuel Morland, Master of Mechanics to Charles the Second. Cambridge, Johnson. pp. 32.

"On the restoration of Charles he was made Master of Mechanics to his Majesty, who also presented him* with a medal as an 'honourable badge of his signal loyalty.' On one side of it was the king's head laureat, with this legend, 'Carolo II. Regi institutori Aug.;' in the table of the reverse, 'In adversis summo vitæ periculo, in prosperis felici ingenio frequens adfuit.' He was soon afterwards made a gentleman of his Majesty's privy chamber.

"During the remainder of his life he employed himself entirely with mechanical experiments, &c. In 1677 he took a lease of a house† at Vauxhall, for twenty-one years, from the heirs of Jane Vaux, the daughter of Guy Vaux, of gunpowder celebrity. This house was situated where Vauxhall Gardens now are.‡ Two years afterwards he had a pension of 400*l.* settled upon him, but some embarrassment in his affairs obliged him to sell it. He afterwards removed to a house at Hammersmith, near the water-side, where he died December the 30th, 1695, and was buried in Hammersmith chapel on January the 6th of the following year.**

"The three last years of his life were spent very wretchedly. Poverty and loss of sight compelled him to rely almost solely on the charity of Archbishop Tenison. He returns him thanks for his kindness, in a letter dated March 5th, 1694, which was far greater, says Sir Samuel, 'than such a poor wretch as I could ever hope for.' Evelyn, in his diary, gives an interesting description of him when harassed with this accumulated load of misfortunes.

"'25th Oct. 1695.—The Archbishop and myself went to Hammersmith to visit Sir Samuel Morland, who was entirely blind; a very mortifying sight. He shewed us his invention of writing, which was very ingenious; also his wooden calendar, which instructed him all by feeling, and other pretty and useful inventions of mills, pumps, &c., and the pump he had erected, that serves water to his garden, and to passengers, with an inscription, and brings from a filthy part of the Thames near it, a most perfect and pure water. He had newly buried 200*l.* worth of music-books, being, as he said, love songs and vanity. He plays himself psalms and religious hymns on the Theorbo.'

"The inscription which Evelyn refers to was on a stone tablet fixed in the wall, and is still preserved; the following is a copy of it: 'Sir Samuel Morland's well, the use of which he freely gives to all persons: hoping that none who shall come after him, will adventure to incur God's displeasure, by denying a cup of cold water (provided at another's cost and not their own) to either neighbour, stranger, passenger, or poor thirsty beggar. July 8, 1695.'

* * * *

"But Morland's principal claims to the notice of posterity are his writings and mechanical inventions: these I shall place as nearly as possible in chronological order, and I have endeavoured to be impartial, having given the various claims to the same inventions, which have been brought forward by others.

"From some correspondence between Morland and Dr. Pell, preserved in the British Museum*, it appears that Sir Samuel, as early as 1666, had intended to publish a work on the quadrature of curvilinear spaces, and had actually proceeded to print part of it, when, by the advice of the latter, he was persuaded to lay it aside altogether. In the rough draft of a letter to Morland, dated April the 7th, 1666, in giving his opinion on the portion of the work already printed, Pell says, 'The love which I beare to truth and to the author of those papers does constraine me to desire that they may rest awhile unpublished.' Morland not only yielded implicitly to his directions, but, in a letter written a short time afterwards, he furnishes arguments against some propositions in his own treatise: 'I should desire,' says he to Pell, 'to bee altogether mute, and to submitt to your judgment in all things.' Pell in another place† informs us that Morland's 'cyclometrical papers are two: one a copperplate, the other a Latin discourse on it.'‡

"It was about this period that he invented his arithmetical machines, which he makes mention of in a letter dated May 13, 1666.** He did not, however, publish an account of them before 1673, when, 'by the importunity of his very good friends,' they were made public. The little work in which they are described is illustrated with twelve plates, in which the different parts of the machine are exhibited. Its operations are conducted by means of dial plates and small indices, moveable with a steel pin. By these means the four fundamental rules of arithmetic are very readily worked,

* Evelyn's Numismata, p. 141.
† On the top was a Punchinello holding a dial. (*Aubrey's Surrey, vol. i. p. 12.*)
‡ *Manning's Surrey, vol. 3, p. 489.*
** *Gent. Mag. 1818, part ii. p. 12.*

* MS. Birch, 4279.
† MS. Birch, 4407.
‡ They became acquainted in Switzerland, but Morland tells us that he saw Pell for the first time at Colonel Montagu's chambers at Whitehall. See MS. Lands. 751, folio 399.
** MS. Birch, 4279.

and, to use the author's own words, 'without charging the memory, disturbing the mind, or exposing the operations to any uncertainty.' His 'perpetual almanac' is given at the end, which was reprinted by Playford in his 'Vade Mecum.'

"From Dr. Pell's collections in the British Museum,* it appears that Dr. Hooke had invented about the year 1670, an 'engine for multiplying and dividing.' The Marquis of Worcester† also, in his Century of Inventions, seems to refer to a similar machine: he calls it 'an instrument whereby persons ignorant in arithmetic, may perfectly observe numerations and subtractions of all sums and fractions.'

"Most biographers assert that he invented the fire-engine, but he ought to be considered rather an improver than an inventor of that machine. As early as 1590, Cyprian Lucar, in his 'Treatise named Lucarsolace,' gave a description of a rude fire-engine which he designated by the name of a squirt: this engine consisted of a large hollow cone, moveable on a wooden frame, and open at the vertex, into which is inserted a long pipe for the passage of the water, which being continually thrown into the cone through a funnel near the vertex, is ejected by a piston at the other extremity, on a principle precisely similar to that of the common squirt Evelyn also mentions a fire-engine invented by Greatorix in 1656, which was ten years before he saw the 'quench-fires' of Sir Samuel.

"We are, however, certainly indebted to Morland for the speaking-trumpet, an account of which instrument he published at London in 1671, under the title of 'A description of the Tuba-stentorophonica, an instrument of excellent use, as well by sea as by land.' In this rare tract, consisting of eight leaves, he gives an account of the various experiments that he made before his instrument attained a certain degree of perfection. The first trumpet that he constructed, although, says Sir Samuel, 'the invention had been long before digested in my thoughts,' was made in glass in the year 1670, being about 2 feet 8 inches in length the diameter of the greater end 11 inches. and that of the other end 2½ inches: 'with this,' he says, 'I was heard speaking at a considerable distance by several persons, and found that it did very considerably multiply the voice.' After giving a description of some experiments with other trumpets, he enters into a philosophic disquisition on the nature of sound, and the *best form* of the speaking-trumpet, which he leaves doubtful, and concludes with 'an account of the manifold uses' of his instrument, which are very excusably magnified: he appears also to have overrated the power of his trumpet, for, in his 'Urim of Conscience,' he says that he has no doubt but what it might be improved so as to carry the voice for the distance of ten miles. A French translation of Morland's tract was published at London in 1671, and, in an advertisement prefixed, it is stated that Morland's tubes were sold by Moses Pitt, a bookseller in St. Paul's church-yard, at the price of 2*l*. 5*s*.

"The principal objects of Sir Samuel's study were water-engines, pumps, &c , which he carried to a high degree of perfection: his pumps brought water from Blackmore Park near Winkfield, to the top of Windsor Castle. A bill to enable him 'to enjoy the sole benefit of certain pumps and water-engines by him invented,' was read the first and second times in the House of Commons, on the 12th and 13th of February 1674, but it did not pass: he obtained, however, a patent for them in the course of the following year. In 1697, two years after his death, a tract by him was published at the expense of his son: it is entitled 'Hydrostatics; or, instructions concerning water-works,' and contains an account of his various methods of raising water, besides tables of square and cube roots: from the close of Joseph Morland's preface, it appears that many of his father's works were still left unpublished. There is also a treatise by Sir Samuel, in the Harleian collection of manuscripts, which is entitled 'Elevation des eaux, par toute sorte de machines, reduite a la mesure au poids, et a la balance: Presentee a sa majeste tres Chretienne, 1683:' at page 35 commences a very short tract on the steam-engine, entitled 'The principles of the new force af fire invented by Chev. Morland in 1682, and presented to his most Christian Majesty, 1683;" and these principles are explained as follows: —"Water being converted into vapour by the force of fire, these vapours shortly require a larger space (about 2000 times) than the water before occupied, and rather than be constantly confined would split a cannon. But being duly regulated according the to rules of statics, and by science reduced ot measure, weight, and balance, then they bear their load peaceably (like good horses) and thus become of great use to mankind, particularly for raising water, according to the following table, which shews the number of pounds that may be raised 1800 times per hour to a height of six inches by cylinders half filled with water, as well as the different diameters and depths of the said cylinders:' then follows his table of the

* *MS. Birch*, 4422, folio 67. See also Hooke on the first part of Mach. Cœl. Hevelii, p. 45.
† *Gent. Mag.* 1748, p. 109.

effects of different sized cylinders.* This evidently indicates a knowledge of the subject, and we may, I think, fairly presume that he was probably the first who actually constructed a steam-engine, although his allusion to the force of steam being sufficient to burst a cannon appears to intimate that he was not a stranger to the volume which the Marquis of Worcester had published some years previously. To his great credit also, let it not be forgotten that he has correctly stated the increase of volume which water occupies in a state of vapour, which must have been the result of experiment: his researches, however, seem to have had little influence on the progress of the practical application of steam."

ON HYDRAULIC AND COMMON MORTARS. BY GENERAL TREUSSART, INSPECTEUR DU GENIE.

[Translated from the French by J. G. Totten, Lt. Col. of Eng. and Brevet Col. United States Army, for the *Franklin Journal*.]

(Continued from page 413.)

ART. III.—*Experiments on several hydraulic limes of the environs of Strasburg, on the Metz lime, and on Boulogne pebbles (continued).*

I have thus far gone into particulars, in order that there might be no doubt as to the manner of proceeding: in the following tables, I shall give fewer details. I repeated the above trial, as shown in the following table, using another piece of lime.

Table No. V.

No. of series.	Composition of the mortars.	Made immediately.		After 15 days.		After 25 days.		After 35 days.		After 45 days.		After 2 months.	
		H	W	H	W	H	W	H	W	H	W	H	W
		d's.	lbs	d's.	lbs	d's.	lbs	d's.	lbs	d .	lbs	d's.	lbs
1	Obernai lime slaked to powder and measured in powder 1, Sand .... 2 } 3	25	264	11	121	15	77	18	88	18	77	20	88
2	Lime the same..... 1, Sand............ 1, Trass........... 1 } 3	12	473	5	330	6	297	10	286	12	304	12	299

I made the above experiments, in the same manner as has been explained of Table No. IV; but it will be seen that the periods, at which the mortars were made, were brought nearer together. Each experiment in the above table, is divided into two columns; the first contains the number of days the mortar required to harden, and is marked H; the second column, marked W, express the number of pounds that the mortar supported before breaking. I shall adopt, hereafter, this order for all the tables which follow, whenever they contain many columns.

The piece of lime which I used for these experiments, was a petrified cornu ammonis, which was 20 inches in diameter. The table shews that with the first mortar, of lime and sand, the hardening was quite slow, which might be owing to the mortar being made so late as the month of October. It is remarkable that the hardening was not so tardy, for the following, which were made fifteen days after slaking. As to the resistance, it was the greatest with the mortar made immediately. That made after fifteen days, lost about half its strength: beyond this period the mortars offered a resistance varying from 77 to 88lbs. and the hardening was slow.

If the mortars containing lime, sand and trass be reviewed, it will be remarked that the resistance was greatest with that made immediately, and that it, afterwards, went on diminishing, but keeping well elevated; and that the hardening of the mortar made at the end of fifteen days, was the most prompt.

When making the experiments of the preceding table, I put aside a piece of the same lime, to allow it to slake spontaneously in the air; after two months I made mortar with it, and obtained the following results: it did not harden till the end of twenty-five days, and the mortar broke with fifty-five pounds, while the table shews that mortar made with the same lime slaked to powder, and which had been left in that state, during the same time, supported a weight of 88 lbs.: this result induced me to recommence the experiment with another piece of lime.

* Tredgold on the Steam-engine, p. 4.

proceeded in this way: I divided the lime into two parts; slaking one of these parts into dry powder, by throwing on a fifth of its volume of water, and leaving the other part to slake in the air. I immediately made two mortars with the lime that had been slaked to powder; in one, I mixed sand only with the lime, and in the other I put sand and trass, and at different periods, I repeated the same experiment. It was not till after fifteen days, that the piece of lime which I had left in the air, gave enough lime in powder to begin two similar sets of mortars. The table following shews the results I obtained:

TABLE No. VI.

No. of series.	Composition of the mortars.	Made immediately.		After 15 days.		After 1 month.		After 2 months.		After 3 months.		After 4 months.	
		H	W	H	W	H	W	H	W	H	W	H	W
		ds	lbs.	days	lbs.	days	lbs.	days	lbs.	days	lbs.	days	lbs.
1	Obernai lime slaked to powder and measured in powder .. 1; Sand .... 2 } 4	10	121	6	132	4	132	5	117	5	70	6	66
2	Same lime air-slaked and measured in powder........ 1; Sand .... 2 } 3			+40	77	+40	44	+40	33	+40	—22	+40	—22
3	Same lime slaked to powder and measured in powder .. 1; Sand .... 1; Trass .... 1 } 3	2	209	2	(1)	2	389	2	352	2	317	3	495
4	Same lime air-slaked and measured in powder...... 1; Sand .... 1; Trass .... 1 } 3					6	352	5	319	6	275	6	455

Observations on the Experiments of Table No. VI.

This table shews, first, that the piece of lime used was not of the best quality. I, however, selected, to make the experiments of Table Nos. IV, V and VI pieces of lime of a yellow fawn colour, which appeared to have been submitted to the same degree of calcination. The trials of Tables Nos. IV and V, were commenced in the month of October, while those of No. VI, were begun in June; the feebleness of the first result of Table No. VI cannot, therefore, be attributed to a cold season of the year; nor can it be attributed to weather too warm, because the experiments of Table No. II, which gave very good results, were made in June. We are obliged, therefore, to infer, as I have already noticed, that pieces of quick lime of the same quarry, are far from having, all of them, the same quality.

The first mortar of lime and sand, augmented its resistance a little, after fifteen days slaking, and its hardening was much more prompt after a month. Beyond this term, the time of hardening went on augmenting, and the resistance diminishing, in a sensible manner, as in Table No. V. It will be seen that for the mortar made, in the same manner, with air-slaked lime, the hardening was very slow; I pursued the examination for forty days, and the mortars were not yet hard. The Table shews that after fifteen days, the mortar gave a resistance much less than that of which the lime had been slaked to powder, and that the resistance went on diminishing. At last it was so weak, that, after three or four months, the mortars were unable to sustain the scale-pan, &c., weighing 22 lbs: the mortars had, in the mean time acquired some consistence, but it was so feeble as to be easily broken between the fingers.

The table shows, also that mortar composed of lime slaked by water to dry powder,

(1) *This mortar broke on being cut; it was very hard, but I could not determine its resistance.* Au.

united with sand and trass, hardened promptly. The resistance was less in the mortar made immediately; but it afterwards augmented, and then diminished, and finally, the last gave a great increase. I do not know to what to attribute the anomalies observable in the resistance of these mortars. The last series, made with lime slaked in the air, and in which there is one part of trass, gave a good result and the hardening was quite prompt; but the resistance was always less than that of the mortar of which the lime had been slacked from water, to powder. This last mortar also presented, after four months, an anomaly which I cannot explain.

It will be seen by the results of the three tables, Nos. IV, V, and VI, that the presence of trass, corrected the evils resulting from the exposure of the lime to the air, after having been slaked by either process. The air-slaked lime had lost almost all its hydraulic properties; but on mixing it with trass it gave, notwithstanding, very good mortar: this is not surprising, since it appears that exposure to the air, has no r effect, than to cause hydraulic lime to pass to the state of common lime, and this last gives very good mortar when mingled with sand and trass.

The importance of these results, induced me to engage in similar experiments with the Metz lime, they are found as follows:—

TABLE No. VII.

No. of series.	Composition of the mortars.	Made immediately. H	Made immediately. W	After 1 month. H	After 1 month. W	After 2 months. H	After 2 months. W	After 4 months. H	After 4 months. W
		days.	lbs.	days.	lbs.	days.	lbs.	days.	lbs.
1	Metz lime slaked to powder and measured in powder........ 1; Sand........ 2 } 3	20	116	30	44	30	22		—2[illegible]
2	Same lime slaked in air and measured in powder........ 1; Sand........ 2 } 3			35	88	15	79	9	88
3	Same lime slaked to powder and measured in powder........ 1; Sand........ 1; Trass........ 1 } 3	3	180*	5	312	11	319	11	385
4	Same lime air-slaked and measured in powder........ 1; Sand........ 1; Trass........ 1 } 3			13	352	9	209*	7	440

Observations on the Experiments of Table No. VII.

I made the above experiments like those in the preceding table. If the first mortar, alone, be compared with No. 39 of Table No. III, it will be seen that the lime used in making the above mortars, was much inferior to that of Table No. III, although the limes appeared to have been burned to the same degree. The trials, in both these tables, were made in the middle of summer, the quantities of sand and all the other circumstances, were the same; nevertheless, the first mortar of Table No. VII, shews a resistance of only 116 lbs., while the similar mortar, No. 39 of Table No. III, gives 262 lbs.

It is seen that the first series, composed of lime and sand, shows the greatest resistance when the mortar was made immediately, and that the resistance went on diminishing. At the end of four months, this mortar could not support the scale-pan, and it broke easily in the fingers. We see, therefore, that with Metz lime slaked to powder, the result is the same as with Obernai and Oberbronn lime.

The second series was begun, at the end of a month, with the same lime left to slake in the air: the result varied from 79 to 88 lbs.—a resistance inferior to that obtained by making the mortar immediately: but on comparing these results with those of Table No. VI, we see that the Metz lime, when air-slaked, gave better mortars, than when slaked to powder with water; while it was the contrary with the Obernai lime, of which the two first series of Table

* These mortars were split in the middle.

No. VI were made. It is also remarkable that the hardening was more and more prompt, with the air-slaked Metz lime, while it required more than forty days for the Obernai lime to harden, in each case.

As to the two series, of Table No. VII, made with lime, sand and trass, good results were obtained, whether the lime was slaked with water to powder, or was air-slaked; in both cases, the resistances went on increasing, and the mortars made of air-slaked lime, gave better results than those of lime slaked to powder, which was the contrary of the results of Table No. VI.

It is to be regretted, that in the first experiment, of the above table, made with lime, sand and trass, the prism of mortar was found split, and separated into two parts. I put the two pieces together, before breaking; but the resistance must have been diminished by the circumstance, and it amounted only to 180 lbs. The last series, also, gives a mortar sustaining 269 lbs., forming an anomaly, when compared with that which precedes, and that which follows; this mortar was cracked, but the parts were not separated.

It will appear from all the experiments reported, in Tables Nos. IV, V, VI and VII, that the saying of masons, that lime loses its energy in the air, is not as regards hydraulic lime, without foundation. All those which I have treated above have passed to the state of common lime, after some months, when they had been slaked with water; and the Obernai lime gave the same result when when air-slaked. I have sought for the cause that might transform hydraulic lime into common lime.

Chemistry teaches us that lime has not the property of absorbing a new quantity of oxygen; but it is not with lime, properly speaking, that we make mortar: it is with the hydrate of lime; that is to say, with lime slaked by water, which enters into combination with it, forming a new body, which may have new properties. It, therefore, occurred to me that hydrate of lime, or, in other words, slaked lime, might absorb oxygen.

In veri ying my conjectures in this respect, I could not employ hydraulic lime, because all those I had at command, contained metallic substances capable of oxidation. I proceeded, therefore, in the following manner: I took a piece of white marble which I assured myself contained almost no iron: I had it calcined in a kiln; as soon as it came from the kiln, I pulverized it, and divided the powder into two equal parts, one of these parts was slaked *with a little water*, and the other was left in *the state of quick* lime. I put the slaked lime, and the quick lime, each into one of those cylindrical glass vessels used to measure liquids: I placed each of these vessels in a plate containing a little water. I then covered the two vessels containing the lime, with two other vessels, of the same kind, a little larger—the mouths of these covering vessels being immersed in the water. By these means the lime was no longer in connexion with the atmosphere, and it was connected with the water, only through the column of air that was between the two vessels. After five or six days, the water had mounted perceptibly, between the two glass vessels, which contained the slaked lime, and at the end of twenty days, it had mounted 4 inches. It must be noticed that at this time, the water had risen very little between the two glasses. containing the quick lime. I repeated this experiment several times, and always with the same result. It, therefore, appeared to me that there had been a great absorption of oxygen by the slaked lime and a slight absorption by the quick lime. I communicated the results I had obtained to Mr. Coze, professor of Pharmacy at the academy of Strasburg, and requested him to ascertain the quantity of oxygen that had been absorbed in the two cases. To that end, a cylindrical glass, graduated, vessel was taken, and one measure of atmospheric air and two measures of deutoxide of azote (nitrous gas) were introduced. As soon as the air in the cylinder had become red, and the water had risen therein, the residue stood at 112 on the scale of the cylinder. The same thing was done with the air that had been in contact with the quick lime: this gave also a red colour, and the residue stood at 117 of the scale. And then the same trial was made with the air that had been in contact with the slacked lime: the red colour was very feeble, and the residue stood at 132 of the scale. In this last case, therefore, there had been a great quantity of gas absorbed by the lime which had been slaked with a little water. To be convinced that it was oxygen, that had been absorbed, hydrogen gas was mixed with the remaining gas, and the mixture submitted to the electrical spark: without any detonation; from which it resulted, that almost all the oxygen had been absorbed by the hydrate of lime.* That the quick lime absorbed but little oxygen, was doubtless owing to this, that this lime could form a hydrate only very slowly, by absorbing water from the dish through the column of air. It appears to me, then, that

* It appears from this, that there is reason for forbidding the occupying of newly plastered houses—as they must be unhealthy. Ed.

it is to the absorption of oxygen we should attribute the singular result, that is obtained by leaving exposed to the air, hydraulic limes that have been slaked with a little water. It has been seen that all the above limes, thus treated, have lost, after a little time, almost all their hydraulic properties, and have passed to the condition of common lime.

It appears to me difficult to explain, why the Metz lime which was slaked in the air gave, at the end of four months, a better result than the lime which had been slaked to powder, while the opposite results were obtained with the Obernai lime. Can this difference be owing to the Metz lime containing the oxide of manganese, which the Obernai lime does not? We know that when oxide of manganese is heated, a great part of its oxygen is disengaged, and that it afterwards absorbs it from the air. When the lime stone containing it has been calcined, it is possible that this oxide prevents the lime from absorbing oxygen by its own greater affinity for it. It will be interesting to ascertain if the same thing happens with all hydraulic limes, containing oxide of manganese.

It will be seen by the above experiments how important it is not to leave exposed to the air for any time, hydraulic limes which have been slaked to powder, unless well assured that they are not of the same nature as those which become, in this way, common limes. The same observation applies to hydraulic lime slaked spontaneously in the air: we ought to be certain that the same effect will not result as in the Obernai lime of Table No. VI. Without this precaution we shall be liable to make very bad mortars out of very good materials; and to cause very important and expensive constructions to fail. If good results were obtained in Tables Nos. VI and VII, with trass mortars, of which the lime had been slaked for a long time—whether with water to powder or spontaneously in the air, it was because common lime always gives good mortars with trass, whatever may have been the slaking process, as will be seen in the sequel. The above experiments on the absorption of oxygen by hydrate of lime, are contained in a memoir on hydraulic mortars which I addressed to the Committee on Fortifications in October, 1823; an extract from that memoir was printed in 1824, and inserted in the 7th number of the *Memorial de l'Officier du génie.*

It remains, before closing this article, to speak of the pebbles of Boulogne, of which, having heard, I caused specimens to be brought to Strasburg: but before reporting the experiments therewith, I must refer to a species of lime, much resembling them, well known in England.

In 1796 Messrs. Parker and Wyatts obtained a patent in London for making a particular kind of lime, which was first called *aquatic cement*, and afterwards, improperly, *Roman cement*. At this moment, this cement is an article of considerable commerce, and is sent even to the Indies. This substance has the property of solidifying, like plaster of Paris, almost instantly, when used in the air, and of taking, very soon, a strong consistence in water. It is mixed with 2, 3, 4. and 5 parts of sand, to 3 parts of cement, according to the use to be made of it.

Captain Le Sage, of the Engineers, has brought to notice a substance like the English stone: it was found by an Englishman, by accident, about 20 years ago, upon the shore of Boulogne: a description is given of it in the 2d vol. of the *Mémorial de l'Officier du génie.* This substance is thrown upon the shore by the sea, in the form of pebbles, seldom weighing more than 2½ lbs. Their colour is, in general, a yellowish and dirty gray: several of these pebbles have the surface, to the depth of $\frac{3}{10}$ths of an inch, of a rust colour: these stones are of a very fine grain, and they are hard. They are found only in small quantities, and here and there, so that they are used at Boulogne only, where they are advantageously employed in hydraulic works. Mr. Drapier made the analysis of these, and Mr. Berthier of the English stone: from a comparison of these two stones, presented by Mr. Berthier in the same table, after deducting the carbonic acid, and the water which is evaporated by calcination, there remains of the substances employed as lime, viz:—

The English stone—lime, 0.554; clay, 0.360; oxide of iron, 0.086.

The Boulogne pebbles—lime, 0.540; clay, 0.310; oxide of iron, 0.150.

I ought to add that the analysis gave for the English stone some thousandths of carbonate of magnesia, and of manganese, which are not found in the Boulogne stones: but these quantities being very small, we see that the two are essentially the same. I now give a table of the experiments made with the Boulogne pebbles.

Observations on the Experiments of Table No. VIII.—*(For table, see next page.)*

The lime of the first eleven numbers of Table No. VIII. was calcined in a lime kiln, being placed with lime-stone producing fat lime; it was, therefore, calcined with the degree of heat required for burning fat lime. The first three numbers are of the lime alone. We were obliged to pulverise the pebbles

TABLE VIII.

No. of the mortar.	Composition of the mortars.			No. of days required to harden in water.	Weight supported before breaking.
				days.	pounds.
1	Boulogne pebbles alone, ordinary burning,			$\frac{1}{2}$	108
2	do.			$1\frac{1}{2}$	132
3	do.			$1\frac{1}{2}$	158
4	do. Sand	2 1	3	20	37
5	Pebbles as above Sand	2 1	3	22	33
6	Pebbles as above Sand	1 1	2		22
7	Pebbles as above Sand	1 2	2		— 22
8	Pebbles as above Sand Trass	1 1 1	3		22
9	Pebbles as above Trass	1 2	3		26
10	Pebbles alone, air-slaked for a month			15	48
11	Pebbles alone, slaked a month with one-fifth the volume of water				— 22
12	Pebbles alone, highly calcined			12	286

as they came from the kiln, because, on throwing on water, instead of being reduced to powder, like fat limes, and ordinary hydraulic limes, they absorb and solidify it. These pebbles afford no vapours on slaking, and give out very little heat. This lime requires less water, than ordinary hydraulic lime, to be reduced to paste. In the above experiments, the pebble lime was reduced to paste a little stiffer than for ordinary hydraulic mortar, because it was perceived that this lime required less water. The first three numbers were made in the same manner; differing only in this, that the first number was put in water after having been formed into paste and exposed three hours in the air; the second number, after two hours exposure, and the third, immediately: it will be seen that this last gave the greatest resistance, but that which gave the least resistance was the quickest to harden, which arose from its having already acquired in the air an evident consistence. We see then, that in constructions in water, when this lime is to be used, it is important to prepare no more mortar than can be used immediately. The numbers from 4 to 9, inclusive, are mixtures of pebble lime with sand in several proportions, and the numbers following contain trass. The hardening was so slow that I was unable to observe them all. We see that the resistance of all these mortars was feeble. It is singular that trass, *which gave such* good results with all the *hydraulic limes* I have tried, gave such feeble results with this pebble lime; it appears that this lime does not bear, with advantage, any mixture. The pebbles of No. 10 were broken up and left to slake in the air for a month; those of No. 11 were exposed during the same time to the air, after having one-fifth of their bulk of water thrown on them. We see that the air-slaked lime gave a very weak result, and that which was slaked with water gave a still feebler, since it was unable to sustain the weight (22lbs.) of the scale pan, &c.

The weak resistances, shown in the first numbers of the above table, gave me the idea of another experiment, after a higher calcination; to this end, I exposed a piece, in a lime kiln, opposite one of the flues intended to convey the heat through the kiln: the pebble was highly burned; it took a deep rust colour, while those less calcined were of a yellow fawn. No. 12, which is the experiment made with the highly burned pebble, was treated like No. 2, being left, in the state of paste, in the air for one hour before being immersed. We see that the resistance was very good, since this No. 12 supported the weight of 286 lbs. before breaking; but the hardening was quite slow. This trial was made with the remainder of my stock of pebbles; otherwise I should have made several essays to ascertain whether by mixing this strongly calcined lime, with sand and trass, I should obtain better results than those given when less burned.

Taken all together, the experiments of table No. VIII, show, that the lime derived

from Boulogne pebbles is a hydraulic lime presenting in several respects great differences from the other hydraulic limes which I have treated. The ordinary hydraulic limes of which I have spoken, demand only the same degree of heat as is required to calcine them a little less. When these limes are but little burned, they form a good body with sand, and give very good results with trass: if the same degree of heat be given as was received by the pebbles in experiment No. 12, they sustain an incipient vitrification, and give only weak results. A circumstance, quite remarkable, is, that when I treated these limes without mixing them with any other substance, those numbers which hardened the quickest, gave the least resistances, while those which took the longest time to harden, gave results much superior to the others. All these experiments were, notwithstanding, made at the same season—the beginning of the winter. The differences which I have pointed out, between Boulogne pebbles and ordinary hydraulic lime, induce me to suspect there might be, in the pebbles, some substance that escaped detection in the analysis. I have, moreover, attempted to recompose this lime, by a mixture of the substances given by the analysis: on burning it, I had ordinary hydraulic lime, and none of the peculiar results given by the pebbles. To ascertain if the pebbles contained any substance not mentioned in the analysis, I took one of the crude stones, broke it, and examining it with the magnifier, I noticed some very small crystals which did not appear to be calcareous. I pulverised these particles and put them, for some time, in distilled water: I then filtered and concentrated the liquid: it had a decided salt taste, and on leaving it at rest, I obtained quite a quantity of crystals of muriate of soda, which had been previously noticed as being present. It appeared to me that this muriate of soda, contained some crystals of carbonate of soda. This did not surprise me, since we know, from the fine observations of Mr. Bertholet, that natron, which is brought from Egypt, is formed by the decomposition of muriate of soda, by the carbonate of lime which exists in the bottom of the lakes, situated in the desert of Thaïat to the west of the Delta. In winter, these lakes fill salt water which enters through the bo and rises about seven feet; on the return of warm weather, the water of the lakes is completely evaporated, leaving on the bottom, which is calcareous, a stratum of natron, which is a mixture of sea salt, (muriate of soda) sulphate, and carbonate, of soda, constituting the soda of commerce: this natron is broken up from the bottom with iron bars. The muriate of soda which exists in the Boulogne pebbles in notable quantity, and the crystals of carbonate of soda which I thought I discovered, induced me to make several experiments (which I shall soon report,) by adding a little soda and potash to a mixture of lime and clay, which I then burned in order to obtain an artificial hydraulic lime.

Mr. Pitot du Helles, formerly an officer of Engineers, now living at Morlaix, sent me, lately, a singular substance which furnishes hydraulic lime, and seems to me to bear analogy to the Boulogne pebbles. This substance appears to come from the fragments of a species of madrepore of which the geological position does not seem to be well known, but which appears to exist outside the roadstead of Morlaix: these fragments are brought by the currents, and form considerable deposits in the roadstead, whence they are raised with the drag, by the boatmen: the farmers make considerable use of it as a manure for certain soils, and give it the name of *merle*. It is in very small and contorted fragments; its colour is a dirty white; it is light. Mr. Grimm, *pharmacieur en chef de la Marine*, at Brest, made an analysis of this substance, which contains: carbonate of lime, 5.25; sand, 1.35; water and organic matter, 3.30; oxide of iron and phosphate of lime, traces; loss, 0.10. Mr. Pitot made lime of this substance, and I made some trials with the specimen he sent me.

When water was thrown on the calcined *merle*, it was almost a quarter of an hour before any heat was manifested, and that so slight that a little vapour was barely perceptible. This lime does not reduce well to powder by slaking; it would be necessary to reduce it by pestles; in this, it presents similar character to the Boulogne pebbles.

I reduced a portion of this lime to paste with water, and placed it at the bottom of a glass filled with water: the hardening was complete at the end of six days, although the experiment was made towards the close of November. I mixed a portion of this lime with an equal quantity of sand: the hardening took place in eight days; and it seemed to me that this lime would not bear much sand. I was not able to ascertain the tenacity of mortar made of this lime; but the manner in which it hardened, and the degree of induration it had acquired in a short time, led me to think that it is a very good hydraulic lime; and that it will be of great advantage in all hydraulic constructions on the coast of Bretagne. I am astonished that alumine was not found in this lime, so eminently hydraulic.

(To be continued.)

REMARKS ON THE MODE OF GEARING MILLS FOR THE MANUFACTURE OF COTTON AND WOOLLEN GOODS. BY I. H. BEARD, CIVIL ENGINEER.

From the Journal of the *Franklin Institute.*

Throughout New England, until within a few years, it was generally thought by engineers and millwrights that cotton mills, and woollen mills, and all others, requiring a very considerable power, could not be run effectively without large and ponderous lines of upright, and horizontal shafts of either cast or wrought iron, and heavy trains of cog-wheels of cast iron, or partly of iron and partly of wood. And when large leather belts began to be introduced for the main gear of mills, as a substitute for gear-wheels, it was thought by some of our best engineers to be an experiment, at the least, of very doubtful result, if not altogether impracticable; and, indeed, at the present time, notwithstanding all the evident advantages of belts over gear-wheels, many still adhere to the old mode of gearing; and this, doubtless, not so much from a want of discernment, and sound judgment, as from a lack of opportunity of comparing and testing the advantages of belts, and the disadvantages of gear-wheels; or, perhaps, they may have formed an erroneous opinion of the utility of using belts from the inspection of some mills, that have been belted on a bad principle, or from belts injudiciously managed.

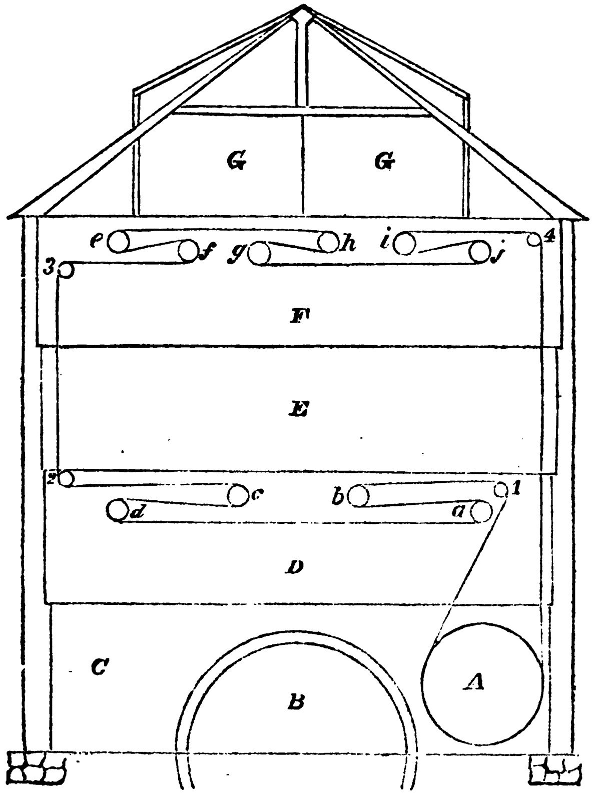
Having, from a constant practical experience of both modes of gearing mills, for more than ten years, at Lowell, Saco, and other places, become fully satisfied of the utility of belting mills, instead of running them with gear-wheels, and that they run much lighter, stiller, and with far less friction, and a proportionally less motive power, with belts than with gear-wheels, I have thought a few hints on the subject might be interesting to some of the readers of the Journal.

A cotton mill of dimensions adapted to the convenient operation of 4000 spindles of cotton machinery, including all the preparation for making yarn, and weaving cloth ordinarily, required four trains of upright shafts, extending through the height of four stories, the trains usually commencing in the basement story.

To each train of uprights were attached from t[illegible] to four pair [illegible]heavy gea[illegible]heels, and in addition to these, in many mills all the counter lines of shafts were geared off at right angles with the horizontal main shafts, which required a very large number of gears and shafts. A mill thus geared is a full load for the power of a moderate sized water-wheel without any machinery, and a great proportion of this unnecessary weight and friction may be saved by the judicious use of belts instead of gears. And besides the disadvantages before named, the trains of gear-wheels require the constant extra expense of careful attendance, and of oil or some unctuous matter to lubricate and keep them from heating, friction, and rapid abrasion. And again, all the gears must be closely boxed in, and supplied with tight dripping pans, or the mill grease will be liable to drop into the work and greatly damage. if not entirely ruin it. These are serious inconveniences and evils that may be avoided by substituting belts in the place of gear-wheels. The first expense, and the constant repairs will be as little with belts as with gear-wheels; and the risk and hindrance that may be caused by belts is far less, for if a main belt breaks, it is the work of a few minutes only to repair it or replace it with a new one, whereas, the breakage of a single gear-wheel may cause the hindrance of a week, and the almost entire loss of the wheel broken, together with a hundred times the labour and expense in exchanging the broken wheel for the new one, that would be caused in repairing or exchanging the belts. And again, if it should be found desirable at any time to change the velocity of any part of the mill gear, it is much more easily done, and with far less expense, by varying the size of the pullies and drums than by cha ging gear-wheels.

But to gear a mill wholly with belts, and to do it judiciously, and to the best advantage, doubtless requires more nice calculation, careful judgment, and practical experience, than to do it with gear-wheels; for many mills have been so belted as to cause more friction, trouble and expense, than would be caused or required in the use of gear-wheels. Therefore, to enable those who may wish to calculate mill-gear, and who may not have had the means of forming a correct judgment by practical experience, to judge correctly of the advantages as well as of the disadvantages of several modes of gearing, I shall first intro luce two or three such modes as I consider objectionable, and then bring forward a mode that I consider the least objectionable, and the best now in use. To know how to avoid an evil is frequently as beneficial as to know how remedy it. Therefore let me first bring forward one or two objectionable modes of belting to enable me the more clearly to illustrate the advantages of what I suppose to be the best and least exceptionable mode of operation.

Elevation of a Cotton Mill.



Explanation. — A represents the main driving pulley, geared from, and driven by the water wheel, and is made from eight to twelve feet in diameter; B, water wheel; C, basement; D, carding room; E spinning room; F weaving room; G G dressing room.

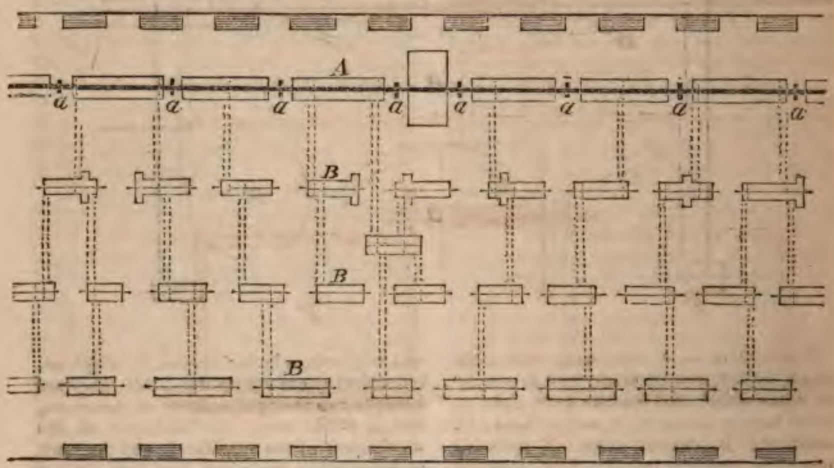
a, *b*, *c*, *d*, *e*, *f*, *g*, *h*, *i*, *j*, represent the lines of drums in the carding and the weaving rooms. These lines of drums extend very nearly the whole length of the mill inside, and for a mill 4000 spindles, are driven by two belts operating in the same manner. 1, 2. 3. 4, represent the belt binders to lead, or bind the belt in the required directions. The belt here represented must be about 320 feet long and from 12 to 15 inches wide, and will require from 600 to 700 pounds of stout belt leather to make it. These belts are bulky, ponderous, and unmanageable; and whenever a lacing breaks, to which accidents they are frequently liable, they are likely to run nearly or quite off of the drums, and it would cause the hindrance of the whole work of the machinery, and the work of some half a dozen men half a day to put one of them on again. But this is not the greatest evil. In passing the drums, the whole stress upon the belt is thrown upon the journals of the shaft of each drum the belt passes, which, besides greatly increasing the power required to operate the mill on account of the multiplied friction, causes the journals to heat and wear beyond the power of any lubrication to prevent; I have seen them heated so much as to render it indispensable to pour on cold water to cool them. To shew more clearly the stress upon each belt and drum:

The power of seven mills in Lowell, Mass.,

containing 32,000 spindles, was equal to 330,000 pounds, raised one foot a second; that is, the machinery 287,000, and the mill gear 43,000 pounds. This gives for the stress on one belt carrying 2,000 spindles, equal to 20.625 pounds raised one foot a second, or 1,237,500 pounds raised one foot a minute, which (estimating a horse power at 32,000 pounds) is equal to very nearly 39 horse power required to operate 2,000 spindles with the other accompanying machinery, and the mill gear, in a mill geared to the best advantage for economizing power; and in a mill belted like the foregoing, the increase of power required to overcome the extra friction cannot, in my opinion, be less than thirty-three and a third per cent. which will make it require, to operate a mill thus geared, 26 horse power to every thousand spindles, and 52 horse power to each belt.

In laying out the gear of a mill, it is worth much time and pains to arrange the drums and belts in such a manner that, so far as may be practicable, the stress of one belt upon the journals shall be counteracted by that of another belt in an opposite direction, referring to the stress upon the line of main drums, the counter drums being of minor consequence; but where the main power is to be exerted, to throw the stress upon one belt into that of another, is economy in the wear of the wear of the whole mill gear as well as in power, both of which are points of great importance to the manufacturer. This point has not always been observed; for it is sometimes more convenient in arranging the gear and machinery of a mill to place the line of main drums upon one side of the mill instead of the centre. And the effect of this arrangement is to throw the whole stress of the belts upon one side of the journals of the main drum shafts, which ought ever to be avoided. The following diagram represents a room belted in that manner.

Plan of the drums of a Carding Room.



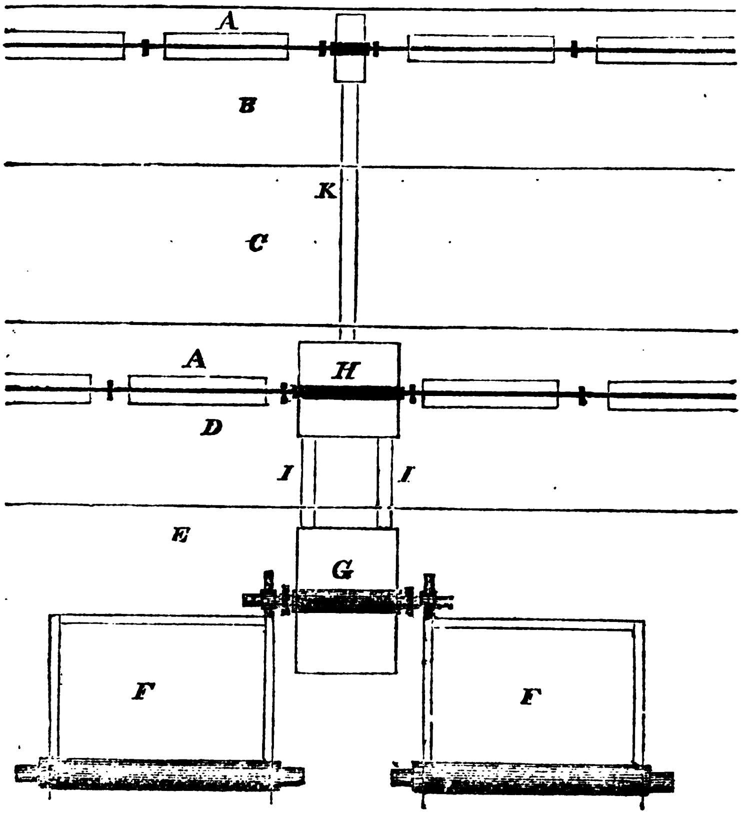
A, line of main drums; *a*, couplings of main shaft; B B B, counter drums; belts drawn with dotted lines.

This sketch is not laid down with reference to the arrangement of machinery of any kind, but merely with a view to show a particular mode of belting which has been disadvantageously adopted in some mills.

It is presumed that a single glance of the eye at this plan will show the ill effects of the arrangement without any further illustration.

The following elevation and plan will represent a mode of gearing with belts in which the stress is as nearly equalized as is practicable, and causing the least possible waste of power and wear of journals by friction, the stress upon one main belt being counteracted by that upon another in an opposite direction, and thereby throwing the power of one belt into its opposite, instead of the bearings of the main line of drums from which the whole power of the mill is taken.

Elevation of a Cotton Mill.

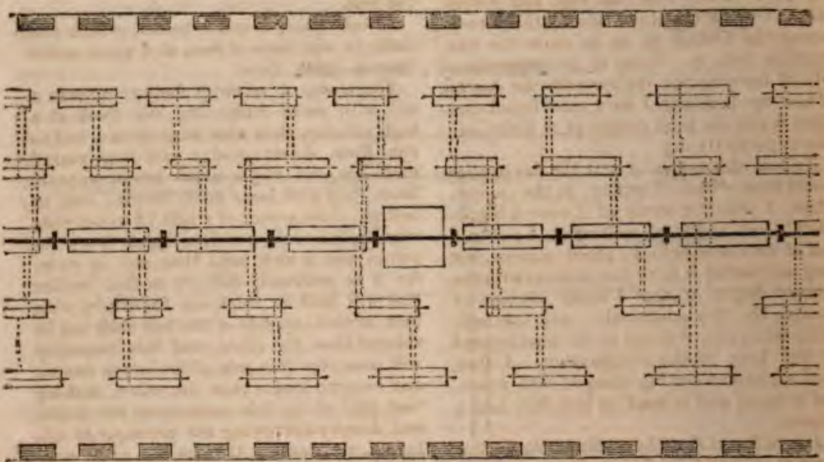


A A, lines of main drums; B, weaving room; C, spinning room; E, basement; F F, water wheels; G, main pulley; H, carding and spinning main pulley; J J, belts; *k*, belt to drive weaving and dressing. In this elevation the two main belts, from the main pulley, sustain the whole power of the mill. Two such belts from 12 to 15 inches wide, made of the best of stock, are capable of operating 4,000 throstle spindles, with all the accompanying machinery for manufacturing coarse heavy cotton goods.

The single belt from the carding main pulley carries the weaving and dressing only, and a belt twelve inches wide is amply powerful for that purpose, even if made of lighter leather than the two belts from the main pulley.

In this mode of belting, the power of the weaving and dressing main belt is made to act against the stress of the first two belts, and, in a good measure, to relieve the bearings of the carding and spinning main pulley.

The following is a plan for relieving the lateral stress.



The above plan is arranged with reference to showing the best mode of belting to relieve the bearings from friction. This object being attained, it is further of great importance that each belt should be of such a length that it will adhere to the drum so much as to prevent it from slipping, and that without the necessity of putting on the belt so tight as to cramp the drums and wear the bearings. Every belt, to run easy and well, should be so slack, when running, that the slack side should run with a waving, undulating motion, without any tension except on the leading side, and when belts will so run without slipping upon the drums or pullies, they will wear for a length of time; for although a belt may be heavily loaded, yet, if at every revolution it can have an opportunity for relief from its tension so as to contract to its natural texture, it will prevent it from breaking by the stress upon it. But if, otherwise, it is kept strained so tensely as to be constantly strained to its greatest extent on both sides of the drums, it will wear but a short time without cracking at the edges, and will shortly be destroyed.

Sufficient care is seldom taken to have belts to run free and easy, and it has been one of the greatest errors, more or less prevalent in all cotton and woollen mills, to run the belts so tense as greatly to injure the belts and rapidly increase the wear of the bearings.

It has been customary in almost all belted mills to affix heavy cast-iron or wooden binders, weighted, to the belts which drive *the main mill* gear to prevent them from *slipping, and* it has been generally thought *impracticable* to keep them from slipping on the pullies and drums without binders; but this opinion is wholly erroneous, and without any true foundation, if the belts are properly prepared. This point I have tested and proved to a demonstration in a cotton mill at Pittsfield, N. H.

This mill contained 3072 spindles of throstle spinning and all the preparation and other machinery for manufacturing coarse shirtings. While I had charge of the mill I geared it entirely anew, and in the manner described on pages 455 and 456. The whole mill was driven by two belts only, twelve inches wide, and with no binders; and every belt in the mill was run very slack and perfectly easy on the drums, and without the least loss by slipping.

The method taken to make them run light and slack without slipping, was as follows; and the plan succeeded so well that every manufacturer who uses belts, ought to know it.

I prepared my belts by stuffing them, after they were completed, with a composition of common tallow, bayberry tallow, and beeswax, in the following proportions, viz. two pounds of common tallow to one pound of bayberry tallow, and one pound of beeswax.

I melted the ingredients in a kettle placed over a furnace of charcoal, and heated the composition to the boiling point, and kept it boiling while applying it to the belts. I put it upon both sides of my belts with a brush, the leather being perfectly dry; and notwithstanding the composition was so hot, the wax did not strike into the belt, but a great proportion of it was left on the surface. I then filled a small iron box stove with charcoal and set it on fire, and when

the stove was at nearly a red heat, I moved the belts slowly over the top, and within half an inch of the stove and by this means heated the leather so as to cause the wax to strike into it. I was at first apprehensive of burning the leather with the degree of heat applied, but I have since found that there is not the least danger of it if the leather is perfectly dry.

To test the degree of heat the dry leather would bear without burning, in the composition, I placed a kettle of it over a blacksmith's fire, and after melting it, I put in a coil of two inch belting, about sixteen feet long and boiled it forty-five minutes with the greatest degree of heat I could produce by blowing the fire continually, and the belt, when taken out, was not in the least injured by the heat of the composition. I then tried a piece of belting damped with water, and it burnt and crisped in less than half a minute.

I have found that, by stuffing belts in this manner, I could work up my stock much closer, for the composition enters into and fills up the thin, porous and spongy parts of the leather, and renders them nearly as firm and durable as the best of the leather cut from the back of the hide.

In gearing a mill, after cutting the hides of leather as close as I deem profitable, I take the remaining thin parts, which are ordinarily considered of very little value, and stuff them in the same manner as I do the belts, and cover all the drums and pullies where the belts are to run, putting them on with the grain side out, and securing them in place with common shoe pegs. Nails are not good for this purpose, for they will work out so as to injure the belts. I then put the belts on to the drums and turn the grain side of the leather in, so that the two grain sides run together. The advantage derived from reversing the grain sides of the leather in contact, instead of the flesh sides, is, that their surfaces are more even, and when well stuffed with the composition, they are so close in contact as very nearly to exclude all the air from between them, and then the pressure of the surrounding air causes them to adhere so firmly that a belt would break, if running at a high velocity, before it would slip on its bearings.

To show, in pounds, the power of the atmosphere on a belt, let us assume a pulley of 4 feet diameter with a 12 inch belt bearing on half of its circumference.

Then $4 \times 3.1416 = 12.5664 \div 2 = 6.2832$ feet, equal to 75.4 inches nearly. And $75.4 \times 12 = 904.8$. square inches of surface in contact.

Multiplying by the pressure of the atmosphere (15 pounds to a square inch) gives $904.8 \times 15 = 53572$ pounds pressure upon the belt.

A belt adheres much better, and is less liable to slip when it runs at a quick speed than at a slow speed.

Therefore, it is much better to gear a mill with small drums and run them at a high velocity, than with large drums, and to run them slower; and a mill thus geared costs less and has a much neater appearance, than with large heavy drums; and, in belting, if the power of a belt 18 inches wide were required it would be much better to put in two 9 inch belts than one so wide, for it is extremely difficult to find leather that will hold its thickness for a very wide belt, so that one side of the belt shall not be thinner than the other, and this inequality will cause the thin side of the belt to stretch and become longer than the other, making that edge of the belt loose upon the drum, and thereby destroying the principle of adhesion, and causing the loss of a great proportion of the power of the belt.

In many mills a practice prevails which is very injurious to the durability of the belts, and ought to be abandoned. That is, the practice of applying currier's oil, or neat's foot oil to the belts, to prevent them from slipping; for the oil opens the pores of the leather, destroys the adhesion of its parts, and, in a very short time, renders it flaccid and rotten, and a belt will not last half so long stuffed with oil as with the composition before named. The experiment is easily tried, and it will prove to any one's satisfaction the truth of this statement.

I am of opinion that engine hose is frequently destroyed more by the use of neat's foot oil than by time and use, and that its durability, generally, might be greatly prolonged if the leather were stuffed with wax and tallow before it is made up, and then occasionally applied after it is put into use.

There are other advantages in the use of this composition: it not only preserves the leather, and keeps it firm, and at the same time flexible, and perfectly pliable, but it does not require half the expense of time in the application that oil does; for belts stuffed with the composition will run well for six months without glazing so as to need a new application.

This composition is impervious to water, and, on that account, is an excellent article for boots und shoes, as well as for engine hose.

I once tried the experiment with a pair of boots, made of a calf-skin curried and finished without a particle of unctuous matter of any kind; and after the boots were made I stuffed them in the same manner that I do my belts (with the addition of a

little ivory black to the composition) and roasted them by a fire until the leather, both soles and tops, were completely saturated; and there never was a particle of oil applied to them, and they were always impervious to water, and their durability exceeded any boots I ever wore.

If the foregoing hasty remarks shall prove of any service to the public, I shall feel amply rewarded for my time in preparing them.

OBSERVATIONS ON MR. BEARD'S COMMUNICATION ON THE SUBJECT OF BELTING AS A SUBSTITUTE FOR GEARING BY WHEELS. BY MR. RUFUS TYLER, U. S. MINT.

(To the Committee of the *Franklin Institute*.)

GENTLEMEN.—I noticed with much satisfaction the valuable communication of I. H. Beard, Esq. on the subject of mill gearing, which appeared in the June number of your journal.

I have long had a desire to see an exposition of that subject, by some one thoroughly acquainted (as the writer of that article appears to be) with the belting system as practised in the eastern cotton and woollen manufactories.

On examination of the article alluded to, I was impressed with the belief that some additional benefit might arise from a more minute investigation of several of the points there introduced, to aid in satisfying the minds of such of your readers as do not readily arrive at the rationale of mechanical operations and arrangements, especially as some of the statements appear somewhat embarrassing and likely to lead to scepticism as to the correctness in his conclusions.

I entirely agree with Mr. Beard in regard to the many advantages of the belting system over that of wheel gearing, and that "to gear a mall wholly with belts, and to do it judiciously, and to the best advantage, doubtless requires more nice calculation, careful judgment and practical experience, than to do it with gear wheels." "For many mills have been so belted as to cause more friction, trouble and expense, than would be caused or required in the use of gear-wheels."

After giving, as objectionable, one of the worst methods of arranging the main belt that ever was devised, (to wit, at page 453 in which no less than *ten* lines of drums, requiring four binders, to strain and give direction to the belt, are represented as being propelled by a single belt of great length,) he says, "in passing the drums the whole stress upon the belt is thrown upon *the journals* of the saft of each drum the *belt passes*, which besides greatly increasing *the power* required to operate the mill, on account of the multiplied friction, causes the journals to heat and wear, beyond the power of any lubrication to prevent."

This passage though sufficiently explicit to convey the general idea intended by the author, leaves room for inquiry as to the relative degrees of force upon the *belt* and *journal* as well as the comparative intensities or degrees of stress upon the *different parts of the belt*.

If we raise a weight of 100 pounds by a cord or strap passing over a series of drums, (running on and off in parallel lines) the first drum in the series, or that nearest the weight will be pressed against the bearings of the journals by a force of 200 pounds, besides the additional force upon the strap at one side of the drum, required to overcome the friction of the drum. For the strap is pulled from the drum on one side, by the weight, and on the other by an equal force required to overcome the weight, both acting in the same direction, and consequently making *one* force equal to their *sum*, which reacts upon the drum, and the additional force necessary to produce motion also re-acting in the same direction.

The tension of the strap thus increased, after passing the first drum in the series, will be thrown in *double force* upon the journals of the second, and then require a *further increase of strain* to overcome the *friction* of the *second* drum. and so on, each succeeding drum being subject to an increase of pressure upon the journals to cause friction, and is attended with an increased stress upon the strap which passes over it; in other words, each drum the strap passes, is pressed against the journals by a force equal to twice the tension of the strap, before it reaches the drum, added to the force necessary to overcome the resistance of the drum itself.

Now if there be ten drums in the series, and we suppose each one to be required to raise a weight of 100lbs., it is evident that a much higher rate of increase will prevail in the tension of the strap in passing the succeeding drums.

Indeed, leaving out the friction altogether, the *strain*, upon the strap in passing the last drum would be ten times as great as at the first, (i. e.) 1000 pounds, and the pressure upon the journals double that intensity.

To carry out this illustration in the case of an actual belt, driving a series of drums, as represented by Mr. Beard, we may substitute (in place of weights representing the resistance to be overcome) a friction clasp or brake, at the journals of each drum, which shall be equivalent to 100 pounds resistance at the periphery of the drum, and acting in such a manner as to avoid pressing

the journals against the bearings to cause friction, and let this resistance represent the ordinary operations of the mill, of which each drum performs an equal share. It is evident that after passing the first drum, the belt must be strained to the tension of 100 pounds, and on the other side only just enough to cause the necessary adhesion of the belt upon the drum (say 50 pounds) making with the 100 pounds upon the pulling side, the sum of 150 pounds pressure on the bearings of the journals of the first drum to create friction.

Omitting for the present the friction of the journals, we shall find that on passing the second drum, the belt must be strained with 100 pounds more force, or 200 pounds upon the pulling side, which with the 100 acting to move the first drum, makes the pressure on the journals 300 pound. We have now a tension on the belt of 200lbs. to be carried around the third drum creating a pressure of 400 pounds, to which we must add, 100, arising from the increased tension of the belt requisite to make this drum revolve; making the pressure against the bearings of the third drum = 500 lbs., the tension of the belt being now 300 pounds. Proceeding in this way the pressure on the bearings of the fourth drum will be 300 + 300 + 100 = 700 pounds, the tension of the belt 300 + 100 = 400. The pressure on the fifth drum 400 + 400 + 100 = 900, tension 500; pressure on the sixth drum 500 + 500 + 100 = 1100, tension 600; pressure on the seventh drum 600 + 600 + 100 = 1300, tension 700; pressure on the eighth drum, 700 + 700 + 100 = 1500, tension 800; pressure on the ninth drum 800 + 800 + 100 = 1700, tension 900; pressure on the tenth drum 900 + 900 + 100 = 1900; tension of the belt 1000 pounds.

This accumulated stress upon the belt must next be thrown upon the *main or driving drum*, which with the necessary strain upon the other side of the main drum to cause the requisite adhesion of the belt (say 50 per cent., as at first assumed = 500 pounds, will give as the pressure upon the journals of the main drum the sum of 1500 pounds. But as the belt goes with its present strain, 500 pounds, to the next succeeding drum, which brings us round to the one we started with, where only 50 pounds is required as the tension of the belt, (and which, under a simple arrangement, would be sufficient) we have no alternative, but must add the surplus of 450 pounds to that assumed in the beginning, which taken twice makes 900 pounds *to be added* to the amount before given as the pressure upon the journals of each drum, except the main or propelling drum. *Thus for the*

First,	instead of	150	say	1050
Second,	"	300	"	1200
Third,	"	500	"	1400
Fourth,	"	700	"	1600
Fifth,	"	900	"	1800
Sixth,	"	1100	"	2000
Seventh,	"	1300	"	2200
Eighth,	"	1500	"	2400
Ninth,	"	1700	"	2600
Tenth,	"	1900	"	2800
Total amount of friction		10050		19050

From what has been shown, we learn how vastly more important it is to avoid all unnecessary resistance at the drums which are remote in the train than it is with drums situated near the propelling power.

It will be perceived likewise, that if the several drums before mentioned had each a separate belt direct from the main drum, none of them would have more than 150 pounds pressure upon the journals, and therefore that the aggregate amount would be only 1500 instead 19050 pounds; and were it practicable to carry out the plan of throwing the strain of one belt into that of another as is sometimes done in particular instances, and as is recommended by Mr. Beard (page 455) in the communication before us, the whole the amount of pressure, upon the journals of all drums, would be (theoretically) but the bare 150 pounds, and *that* upon the furthest in the series from the main drum, exclusive of what is on the main drum.

It now remains to show the effect of the friction which arises from the tension of the belt, and to show the whole amount of power *wasted*, compared with that required to do the work.

The *force* of friction at the rubbing surface may be taken at one-seventh of the pressure. Now the first drum of the series, in the foregoing example, was found to be loaded with a pressure upon the journals of 1050 pounds (exclusive of any effect of the friction caused thereby in adding to the tension of the belt and consequently increasing the pressure) one-seventh of which is 150 pounds at the surface of the journals.

Allow the drum to be ten times the diameter of the journals, and the force of resistance at its periphery will be $\frac{1}{10}$th of the intensity, or 15 pounds = $\frac{1}{70}$th of the *pressure*, the degree in which the stress of the belt must be *increased* to meet the demand of *friction*.

This increased tension of the belt, extends to the main drum, re-acting upon the first only 15 pounds, twice that force, or 30 pounds upon each of the remaining 9 drums over which it passes. The sum of these pressures 30 × 9 + 15, = 285 pounds the

pressure due to the friction of the journals of the first drum.

The pressure found for the second drum, as given in the table 1200, and the above 30 pounds from the friction of the first drum, is 1230 pounds for the actual pressure against the bearings of the second; $\frac{1}{70}$th of this pressure, or $17\frac{4}{7}$ths pounds goes to increase still further the tension of the belt beyond this second drum, throwing $17\frac{4}{7}$ths pounds additional pressure on the bearings on the second, and twice that force upon each of the remaining eight, or, omitting fractions, $35 \times 8 + 17 = 297$ pound pressure due to the friction of the second drum.

Again $\frac{1}{70}$th of the 1435 pounds pressure on the third drum, as the increased tension of the belt, added to the pressure of the third, and twice upon each of the seven remaining drums, gives $40 \times 7 + 20 = 300$ pounds for the friction of the third drum; fourth drum 300; fifth drum 286; sixth drum 261; seventh drum 224; eighth drum 175; ninth drum 114; tenth drum 41 pounds, in whole numbers, as the pressures on these several drums, from these several degrees of friction arising out of their respective proportion of labour and relative position in the series.

The sum of all these pressures is 2226 pounds, which added to the sum of the pressures before set down as due to the proper labour of the several drums, amounting to 19050 gives 21276. If to this we add 1500 pound, the pressure before given upon the journals of the *main drum*, the amount will be 22776 pounds, as the entire pressure (sufficiently accurate for our purpose) upon all the drums upon the plan and under the conditions specified. Whereas, upon the plan of having a *separate belt* for every drum, leading from one side of the main drum, allowing 150 pounds for each drum, and the same for each upon the main drum, that is 300 pounds pressure for each of the ten drums, and 64 which is $\frac{1}{7}$th of the whole, on account of the friction arising therefrom, the total of pressure will be 3064 instead of the 22776 pounds, whilst the sum of the tension of all the belts, at the tightest side, will only equal *half the greatest tension of the long belt* employed in the foregoing plan.

The effect of friction, taken at the surface of the drum (where the labour to be performed, was estimated,) say $\frac{1}{70}$th of the pressure, will be, to consume $\frac{308}{1000}$ths as much power, as is required for the proper labour of the mill, in the one case, and only $\frac{44}{1000}$ths in the other case—or as 1 to 7.

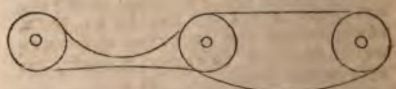
After some appropriate remarks upon the *mode of* arrangement, which places the line *of main drums* at one side, instead of in the middle of the room, Mr. Beard gives what he con plan, which, according to my limited knowledge of cotton and woollen mills, appears a very judicious one for accomplishing so desirable an object, as that of the pressure of one belt, counteracting by another, thereby preventing a vast consumption of the power, by unnecessary friction.

A few remarks upon another point advanced by Mr. Beard, will close this notice of the very important subject before us, which I should have been gratified to have seen from an abler hand than mine.

The point alluded to is that of the advantages of placing drums so far asunder, when circumstances will permit, as to give the belt sufficient *length, to cause adhesion to the drum, without too great a tension of the belt.*

"It is," says he, "of great importance, that each belt should be of such a length, that it will adhere to the drum so much as to prevent it from slipping, and that without the necessity of putting on the belt so tight as to cramp the drums and wear the bearings. Every belt, to run easy and well, should be so slack when running, that the slack side would run with a waving undulating motion, *without any tension,* except on the leading side &c."

It will be difficult, I believe, to understand, how a belt can at one time owe its adhesion to its *tension* at both sides of the drum, and at another time, to its *greater length,* between the drums, and *its tension on one side only*: For it should seem that under any circumstance, (except by some adhesive substance interposed to prevent it) a complete relaxation of tension upon one side, would amount to a relaxation of the of the other, and if the fact be as stated (and I believe it to be pretty generally received as such) I know of no principle upon which to solve the difficulty, unless it can be shown, that when one side is slack, it has a greater bearing surface on the drum, by lapping further round it. That this cannot always be the case, the following cut will show. The cut represents a section of these drums, the middle being the driving one, the belts of course leading off right and left.



It is obvious on inspection, that whilst one of the belts will gain by lapping farther round the drums, the other will loose in that respect.

It appears necessary therefore to seek some other explanation—may it not be

owing to the continual flapping of the belt, which increases the tension for the moment in a sort of *twitch*, at each vibration, and that the momentum of the drum, continues it in motion, during the interval when the tension is of course diminished?

Admitting this *suggestion* to be correct as far as it goes, still there would be an appreciable difference; it would seem, in the two belts represented in the cut for the reasons before suggested, besides leaving a considerable portion of the strain and pressure to destroy the belt and wear the bearings. One thing is certain that whether the belt be long or short, one means of securing it from slipping is to make it *shorter*.

There is much justice in the remarks of Mr. B that sufficient care is seldom taken to have belts to run free and easy, and it has been one of the greatest errors more or less prevalent in all cotton and woollen mills to run the belts so as greatly to injure the belts, and rapidly increase the wear of the bearings—and when belts will so run without slipping upon the drums or pulleys, they will wear for a great length of time. For although a belt may be heavily loaded, yet, if at every revolution it can have an opportunity for relief from its tension, so as to contract to its natural texture, it will prevent it from breaking by the stress upon it.

May not the belt of greater length be more durable, chiefly on account of its being less frequently strained, and bent and straightened in passing round the drums or pulleys?

One word on the subject of high velocities: Mr. B. says "a belt adheres much better and is less liable to slip when it runs at a quick speed, than at a slow speed." I have frequently before heard this thing asserted, and have myself observed something of the kind in a case where the work done was interrupted or irregular.

Not being able at this time to assign any better reason, I attributed it to the greater *momentums* of the moving parts, acting in a degree as a fly wheel. In the case alluded to a rope instead of a belt was used.

AN ACCOUNT OF AN IMMENSE CHIMNEY, RECENTLY BUILT AT CARLISLE; WITH SUGGESTIONS FOR APPLYING CHIMNEYS OR CONES, OF IMMENSE HEIGHT, TO SCIENTIFIC PURPOSES. BY P. A.

(From the *Architectural Mag.* for April.)

"The immense chimney attached to the new cotton factory, now being built for Messrs Peter Dixon and Sons, in Shaddongate, had the last stone placed upon it on *October 24, 1836. It is* one of the highest buildings in England, being 305 ft. from the ground; and, for the purpose to which it is to be applied, is understood to be the highest erection in the world. It may be distinctly seen for many miles in all directions around Carlisle, and forms a beautiful object in the view of our city, from which ever quarter you approach it. The building is of the octangular form, and is built with brick, the angles being formed of stone. The base, which is built with fire-bricks, is 17 ft. 8 in. in width inside, and the thickness of the wall at the foundation is 10 ft. It tapers upwards to a width, inside, of 6 ft. 3 in.; and on the outside, 8 ft. 9 in. Near the top there is a cornice of stone, 7 ft. in depth, which projects 3 ft., and above this there are 8 ft. 3 in. of brickwork, surmounted by a coping stone one foot in thickness. The cornice gives a finished and classical appearance to the building, and the whole would be taken for some splendid national monument, rather than a mere conduit pipe for smoke. It is not a little creditable to Carlisle, that this magnificent work was entirely executed by a native of that city, a builder, Mr. Richard Wright, who has completed it in a way to give the most entire satisfaction to every scientific man who has examined it. Considering its immensity, the work was completed in an incredibly short period of time. The foundation stone was laid on Sept. 11, 1835, by P. Dixon, Esq.; he first brick was laid by Mr. Wright, on Sept. 17; the last course of bricks also by Mr. Wright, on Oct. 22, and the last coping stone on Oct. 25, 1836; thus completing the work in thirteen months. The erection was carried on from the inside, stages being erected as the work proceeded, and the workmen and materials being taken up in boxes prepared for the purpose, by a crab worked by four men; and it is gratifying to add that the whole was finished without any accident occurring to any individual engaged in it.

"As the work approached conclusion, numbers of people expressed an anxiety to have a peep from the top. In order to gratify the public curiosity, the Messrs. Dixon ordered a box to be prepared, and the necessary arrangements to be made to accommodate as many as might choose to ascend. The workmen finished their labours about noon; and, the day being very clear, although very windy and extremely cold, numerous parties ascended in the course of the afternoon, and this accommodation was continued for a few days. The box was calculated to hold four persons, three visitors and a guide, who had been accustomed to ascend the building. A door opened on each side of the box, to admit the passengers, and was then locked, and the word being given, it

slowly ascended to the 'upper regions,' a process which occupied about fourteen minutes. When within a few feet of the top the box passed through a trap door, which immediately fell down again, and thus afforded a secure landing place. From this the ascent to the top is by two ladders of about 7 ft. each, and as the visitor rises upon the last platform the most magnificent sight bursts upon the view. The city lies at his feet, with all its winding streets clearly and distinctly seen as upon a map; and the huge factory itself, to which the chimney is but an adjunct, looks like a building of some two stories in height. It forcibly illustrates Shakspeare's description of the appearance from Dover cliffs:—

———— 'How fearful
And dizzy 't is, to cast one's eyes so low!
The crows and choughs that wing the midway air
Show scarce so gross as beetles: half-way down
Hangs one that gathers samphire; dreadful trade!
Methinks he seems no bigger than his head:
The fishermen that walk upon the beach
Appear like mice: and yon tall anchoring bark,
Diminish'd to her cock; her cock, a buoy
Almost too small for sight.'

"The view of the country around is most extensive and picturesque. The spot on which the chimney stands seems the centre of a huge amphitheatre, to which the horizon forms a circular boundary. Rich and fertile valleys intersected with farm-houses and the seats of country gentlemen, and with the rivers winding, like streaks of silver, in the most beautiful curves, lie extended in such extent and variety, that the eye for a time is bewildered by the number of objects presented; whilst the mountains rise pile above pile on each side, like walls surrounding the mighty area. On the west side might be seen the estuary of the Solway, with vessels taking their departure from Bowness; and on the other, the locomotive engines careering along to the opposite side of the island, carrying with them to the east tokens of the wealth and enterprise of the west. Altogether a sight more enchanting and exhilarating can scarcely be conceived. On Oct. 24 the thermometer at the bottom of the column stood at 41° in an exposed situation; at the top of the column, exposed in the same aspect, it was at 38°." (*Carlisle Journal*, October 29, 1836.)

Soon after I read the above account, I fancy I fell asleep; but whether awake or asleep as I sat by my fire, the following thoughts came into my head, which I hope you will not set me down as unpardonably foolish for communicating to you. I thought the British Association had grown enormously rich (as it is to be hoped they will); that they had money at command to spend upon every great object for the advance of science; and that, amongst others, it had been determined to erect a tower, or chimney, five thousand feet in height, to be wholly devoted to the purposes of scientific research or observation. It was conceived, that by having a tower of this height, with easy access to its summit, many problems in meteorology, electricity, terrestrial magnetism, and astronomy, &c. might be solved at once, which can now either be only arrived at circuitously or not at all. It seemed that the designs were complete, and that nothing more was required, but to choose a site, where a foundation sufficiently good, and abundance of material, could be procured. One of the coal districts was chosen, where there was foundation on the solid rock; clay, to make bricks; sandstone and lime in abundance; and coal to be used in making the bricks, dressing the stones by steam power, and elevating them on the lofty summit by the same.

The general form was to be conical, and a floor with a circular aperture was to be placed at every 500 feet, while by suitable machinery a stage could be elevated to the summit from below, or lowered again with people or instruments, in a few minutes.

The lower part was to be made of stone, and the upper of brick; least if all be made of the latter, the upper might crush the lower part with its weight. I thought I heard that the first experiment was to be, to repeat that made in St Paul's of letting a body fall so as to prove the rotation of the earth; and that in this case, some important deductions could be made from the experiment.

It seemed to me, at first, that a high mountain would answer all the purposes of the tower; but, on reflection, I soon saw this was not the case. Now, my reverie, or dream, as such things generally are, was rather confused and indistinct in some places; but I was so much struck with a sort of vein of sense or reality which ran though the whole, that I determined to give you an account of it; and would be much obliged for my own information, and that of our country readers like myself, if you or some of your intelligent and scientific correspondents would consider, and say whether such a tower could be built; and, if so, would it really have any scientific uses? and, if both, what would be the detail of its construction and its cost? Surely a *company* could be got up to build it, if it could be shown to be of use: and how grand a national monument it would be! In an economical point of view, it would pay by showing people the view from the top, at so much a head.

I hope, because I have sent you the above speculation, you will not consider me bereft of my wits. The idea is not intended as any covert attack upon the British Association for the Advancement of Science; far from it: on the contrary, I seriously do believe, that, if such a tower, cone, or pyramid, could be accomplished (but this, I fear, is out of the question), its scientific uses would be many and great; at all events, the novelty of the idea will, I trust, set some of your correspondents to work, to consider the means of carrying such an idea into execution; and, in this view, the problem wnich I have proposed may prove neither useless nor uninteresting.

Belfast, Jan. 29. 1838.

LIST OF ENGLISH PATENTS GRANTED BETWEEN THE 24TH FEBRUARY, AND THE 25TH OF MARCH, 1838.

John Thomas Betts of Smithfield Bars, London, rectifyer, for improvements in the manufacture of gin, which he intends to denominate "Bett's patent gin," or "Bett's patent stomach gin," being a communicativn from a foreigner abroad. Feburary 24; six months.

Michael Wheelwright Ivison, of Halles-street, Edinburgh, silk spinner, for an improved method of consuming smoke in furnaces, and other places where fire is used, and for economising fuel, and also for applying air heated or cold to blasting or smelting furnaces. Feb. 24; six months.

Josiah Pearce Holebrook, of Devonshire-place, Edgeware Road, gent., for an improved method or improved methods of propelling vessels. Feb. 27; six months.

John Danforth Greenwood, and Richard Wynne Keene of the Belvedere Road, Lambeth, manufacturers, for an improvement in the manufacture of cement, and in the application of cements and other earthy substances to the purpose of producing ornamental surfaces. Feb. 27; six menths.

Hippolyte Francois De Bouffet Montauban, Colonel of Cavalry, of Sloane-street, Chelsea, and John Carvalho de Medeiros, of Old London-street, merchant, for certain improvements in the means of producing gas for illumination, and in apparatus connected with the consumption thereof, being a communication from a foreigner residing abroad. Feb. 27; six months.

William Wastley Richards, of Birmingham, gunmaker, for an improved primer for fire arms. March 2; six months.

Charles Fletcher, of Stroud, Gloucester, mechanist, for certain improvements in the construction of looms for weaving. March 5; six months.

William Lewis, of Brinscomb, and John Ferrabee, of Thrupp Mill, in Gloucester, for certain improvements in machinery for dressing woollen and other cloths or fabrics requiring such a process. March 5; two months.

Henry Bessemer, of City-terrace, City-road, engineer, for certain improvements in machinery or apparatus for casting printing types, spaces, and quadrats, and the means of breaking off and counting the same. March 8; six months.

William Hale, of Greenwich, engineer, for improvements in steam-engines and apparatus connected therewith, and in machinery for propelling vessels. March 8; six months.

Morton William Lawrence, of Leman-street, Goodman's-fields, sugar refiner, fof certain improvements in the proce-s of concentrating certain vegetable juices and saccharine solutions. March 8; four months.

John Seaward, of the Canal Iron Works, Poplar, engineer, for his invention of an improvement or improvements in steam-engines. March 10; six months.

Claude Schroth, of Sabloniere Hotel, Leicester Square, gent., for certain improvements in preparing, pressing, and embossing the surface of leather, being a dommunication from a foreigner residing abroad. March 10; six months.

Thomas Evans of the Dowlais Iron Works, Glamorgan, for an improved rail for railway purposes, together with the mode of manufacturing and fastening down the same. March 10; six months.

Abraham Larker, of Gower-street, Bedford-square, surveyor, and Oliver Byrne, of the same place, professor of mathematics, for a new instrument for guaging malt, and also for guaging the fluid or solid contents of casks and other vessels. March 10; six months.

William Dale, of Marsh-street, Stafford, turner, for certain improvements in constructing columns, pillars, bed-posts, and other such like articles. March 14; six months.

Thomas Joyce, of Camberwell, New Road, gardener, for certain improved modes of, and apparatus for applying prepared fuel to various culinary and domestic purposes. March 15; six months.

William Horsefield, of Swillington Mills, near Leeds, corn miller, for certain improvements in the construction of mills for grinding corn. March 19; six months.

Louis Joseph Amant Ramel, Lisle-street, Leicester-square. gent., for improvements in machinery for excavating and embanking earth for the construction of railways and other works. March 19; six months.

Robert Lucas Chance, of the Glass Works, Smethwich, Stafford, for improvements in the manufacture of glass, being a communication from a foreigner residing abroad. March 19; six months.

Duchemin Victor, of Gracechurch-street, gent., for improvements in rotary engines to be worked by steam or other aeriform fluids, being a communication from a foreigner residing abroad. March 19; six months.

James Hill, of Haley Bridge, Chester, cotton spinner, for a certain apparatus applicable to machinery used in the preparation of cotton and other fibrous materials for the purpose of spinning. March 19; six months.

LIST OF SCOTCH PATENTS GRANTED BETWEEN THE 22D FEBRUARY AND THE 22D MARCH, 1838.

Sir James Caleb Anderson, of Buttevaut Castle, Cork, Baronet, for certain improvements in locomotive Engines, which are partly applicable to other purposes. Sealed 3rd March. 1838: four months to specify.

Morton William Lawrence of Lemon-street, Goodman's Fields, Middlesex, sugar refiner, for certain improvements in the process of concentrating certain vegetable juices and saccharine solutions. March 6.

John Clark, the younger, of Mile-end, Glasgow cotton spinner, for improved machinery for turning, some part, or parts of which may be made applicable to other useful purposes. March 6.

John Edwards, of Lincoln's Inn Fields, Middlesex, pen manufacturer, for certain improvements in instruments used in writing. March 8.

Julian Augustus Turner, of Henry-street, Liverpool, architect, for an improved method of propelling vessels through water. March 13.

Eugene Richard Ladislas de Breza, of Paris now of St. Martin's-street, Leicester-square, Middlesex, gent., for a chemical combination, or compound, for rendering cloth, wood, paper, and other substances indestructible by fire, and also preserving them from the ravages of insects. March 19.

John Paterson Reid, power loom manufacturer, and Thomas Johnson, mechanic, Glasgow, for certain improvements in preparing yarn or thread by machinery, suitable for warps, in preparation for weaving on looms. March 22.

IRISH PATENT GRANTED IN FEB., 1838.

John Upton, of New-street, Southwark Bridge, Surrey, engineer, for an improved method or methods of generating steam power, and applying the same to ploughing, harrowing, and other agricultural purposes, which method, or methods, is, or are also applicable to other purposes to which the power of steam is, or may be applied. Feb. 21.

NOTES AND NOTICES.

Atlantic Steamers.—The "Great Western" steam ship will start so soon after the "Sirius" as to stand a fair chance,—should her steaming powers prove so great as they are reported to be, on the strength of her experimental trips—of being the first to arrive at New York. The Great Western leaves Bristol on April 7th, five days after the Sirius is to leave Cork. Two others will soon be ready to follow, and so many more are in preparation that, always supposing no great disaster to occur, the Atlantic bids fair soon to become "a great thoroughfare" for steam-vessels.

The Share-Fever in Paris.—The suppression of the gaming-houses at Paris has had the effect of turning the attention of the speculators solely to the joint-stock companies which at present so abound in the French capital. The effect has been to produce what is called "a share-fever," greater, if possible, than that which raged in London in 1824. The legislature has taken the alarm, and bills have been introduced in the Chamber of Deputies for placing greater restrictions on the forming of companies than hitherto The laws as they stand are so lax upon this point as to afford every facility to artful swindlers, who are so active in turning the present unexampled mania to their own advantage, that it has become necessary for the Chamber to interfere in order to prevent the social convulsion which must otherwise shortly ensue.

A "Notion" of Brother Jonathan's.—The "Mechanic Association" of Boston (America), have set on foot a novel sort of "fancy fair." It consists of an exhibition of models of machinery, specimens of manufactures, &c., all the productions of the working men of Boston at their leisure hours, which were arranged for public inspection something in the fashion of our fancy fairs at the Egyptian Hall and elsewhere, the money taken at the doors being appropriated to charitable purposes. The quantity and quality of the articles shewn are said to have been such as to reflect the highest credit on the exhibitors, and the scheme proved most successful, the rooms being continually crammed with gratified spectators. It is proposed to make the exhibition annual.

Kyan's Patent.—The "Anti-Dry-rot Company" have given notice of their intention to apply for a renewal of the patent, after the fourteen years for which it was granted have expired. As the new act contemplated the encouragement of *inventors* in the extension-clause, it would seem that the application should rather be from Mr. Kyan than the company. True, as they duly rehearse, they have purchased the whole of his interest therein,—but they purchased the patent for fourteen years only,—the extension is a *bonus*, due, if due at all, not to a commercial company which has bought the monopoly of the invention for a certain term, but to the individual whose discovery, sooner or later, will be of advantage to the public for all time. The company has not the shadow of a right to the renewal, unless they apply for it on behalf of the inventor.

French River Navigation.—Steam navigation is making rapid progress on the rivers of France. The Seine already maintains a considerable number of vessels, although the scarcity of water at certain seasons is a great obstacle, and always prevents them from getting up to Paris. The same objection does not apply to the river Oise, for the steam-navigation of which a company has just been formed, who are on the eve of commencing operations, everything being ready except the engines. These are daily expected from *England*, whence most of the machinery of that nature is still imported.

"An Enemy to Humbug" should give his own name (confidentially, if he please,) and the names also of the establishments to which he refers. Mere denials and assertions will not do.

We like X. Y.'s first specimen, but should like to have one or two more in hand before we begin the series, and shall feel obliged by his compliance.

X. X.'s defence has not altered in the least our opinion of Dr. Arnott's stove and pamphlet, and if inserted would require a rejoinder which might cause us to be thought more unmerciful than we have any inclination to be. We prefer, therefore, leaving our opinion to stand as it is, and to tell for what it is worth. We shall be glad, however, to hear from X. X. on any other subject.

Mechanics' Magazine, Complete sets.—The proprietor of the Mechanics' Magazine has now effected the repurchase of the earlier portions of the stock of this journal from the parties who were possessed of the same in the right of his first publishers; and he is now able to supply several complete sets of the work. Price, twenty-seven volumes, half-cloth,

LONDON: Printed and Published for the Proprietor, by W. A. Robertson, at the Mechanics Magazine *Office, No. 6,* Peterborough-court between 135 and 136, Fleet-street.—Sold by A. & W. Galignani, *Rue Vivienne*, Paris.

END OF THE TWENTY-EIGHTH VOLUME.

INDEX

TO THE TWENTY-EIGHTH VOLUME.

* By a mistake of our printer, two sheets, x and y of this volume, are paged with the same series of numbers, viz. 221 to 286. Those numbers in the index to which an asterisk is appended, as 329*, *refer to the pages in No. 758.*